The Electrical Industry's Weekly Magazine

April 6, 1959

Electrical World

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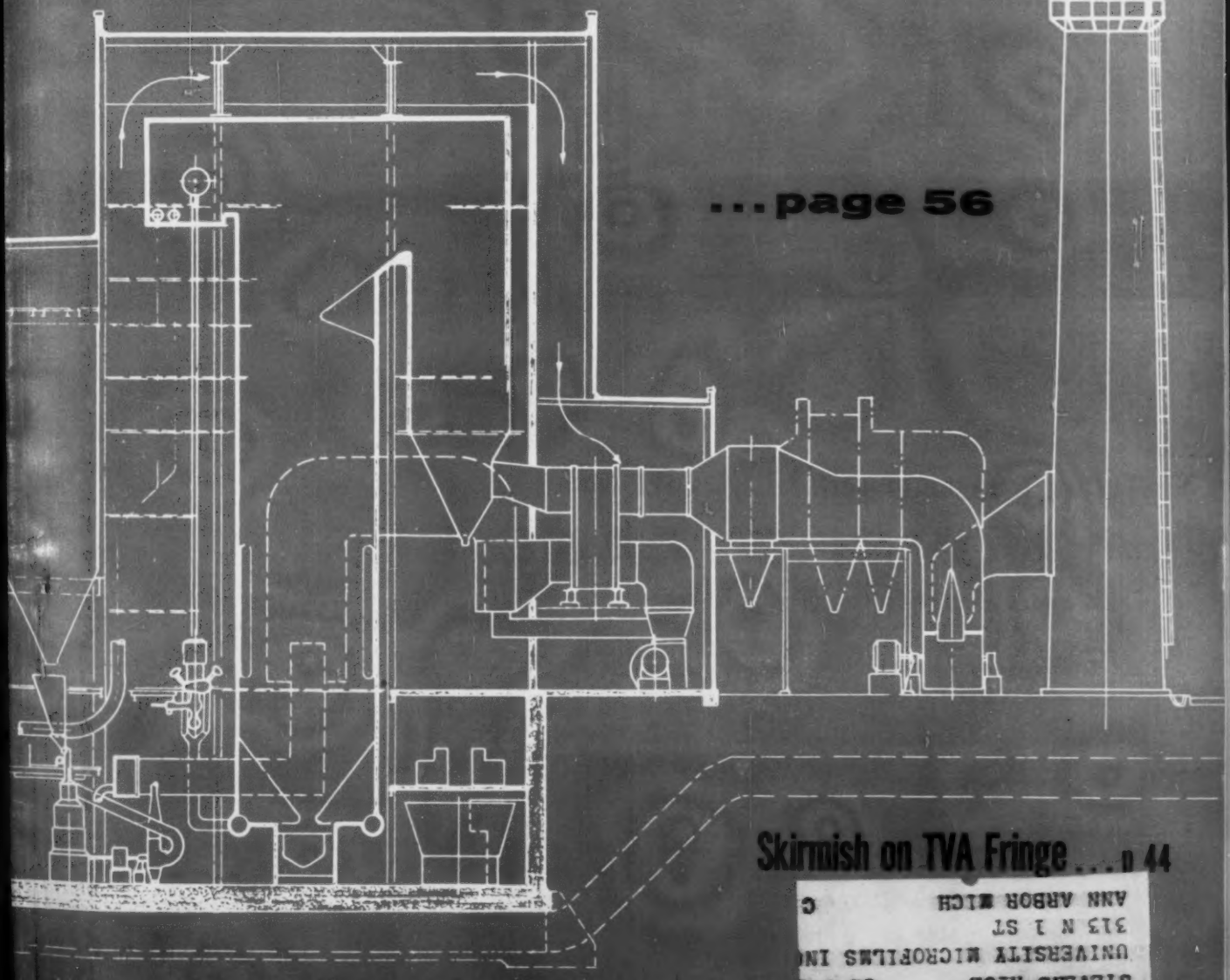
Allen Plant Builds for 1,200-Mw Capacity

...page 56



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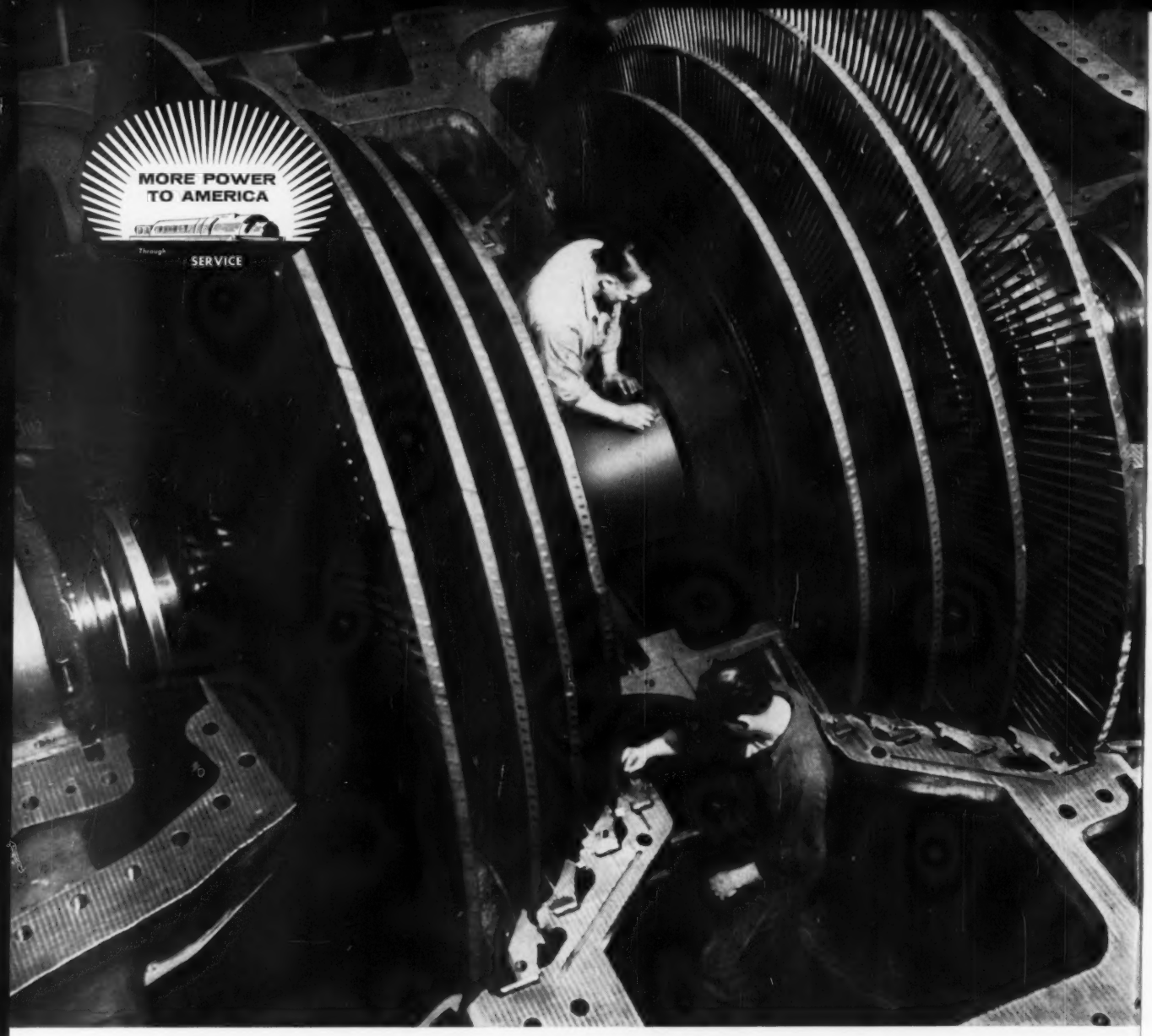

Turbine-generator *reliability* is the result of . . .

KNOW-HOW AND SERVICE

Reliability contributes to determining the cost of power generation and the need for system reserve capacity. A unit's reliability becomes increasingly important as larger-capacity turbine-generators are added to a system.

KNOW-HOW—General Electric steam turbine-generators are continually demonstrating the outstanding reliability designed and built into each unit. Engineering and manufacturing know-how and skills at General Electric contribute to this product leadership.

SERVICE—This built-in reliability is protected and maintained by experienced service guidance. General Electric's nationwide turbine-generator field service team—853 engineers and specialists with a combined total of 5,458 man-years of turbine-generator service experience—help keep power makers on the line. Backing up this skilled service team are the manufacturing and engineering capabilities of some 7,000 turbine-generator people at the factory, as well as 50 General Electric Apparatus Service Shops located strategically across the nation.

FACTOR IN NATIONAL SECURITY—Reliable power generation is vital to national security. Recognizing this, General Electric facilities and manpower respond to the needs of electric utilities day in and day out. Whether it be planned or forced outages, natural disaster, international conflict, the General Electric Company is prepared to render prompt, expert service . . . to diagnose, repair or replace power generation equipment.

For more information on these General Electric capabilities, write for Bulletin GED-3666, "Keeping Power Makers on the Line." General Electric Company, Section 301-403, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Electrical World

Vol. 151, No. 14 APRIL 6, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

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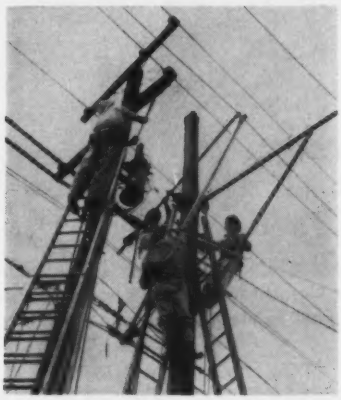

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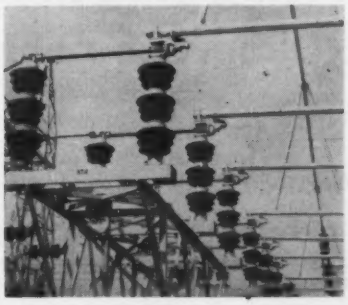

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If fringe cities' plans to get TVA power should prove successful, effect on KU system would be small, Fairman says..p 44

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Survey Reveals Fuel Plans of 248 Utilities

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E. P. Miller, South Carolina E&G Co

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Okonex-Okoprene 15kv primary distribution cables solve Magnolia Petroleum Company's space problem and climate problem (wet and salty atmosphere) and provide greater safety in its Beaumont refinery.

Magnolia Refinery improves voltage regulation, beats humidity with Okonex-Okoprene cables

The giant 1,500-acre Magnolia Petroleum Company refinery, located on the broad Gulf Coast Plain, generates and uses 900,000 kilowatt hours a day, more than its neighboring city of Beaumont, Texas. A cable breakdown here could cause costly damage to equipment and the material in process (more than 400 oil products are manufactured). The entire cable system must serve Magnolia's round-the-clock operation without interruption in the face of the high moisture-saline content of the air, plus the chemicals and intense heat used at many of the processing units.

For the 15kv primary aerial loop distribution system, Magnolia's engineers selected shielded Okonex-Okoprene cables. These butyl-base insulated, neoprene-sheathed constructions saved space, eliminated safety problems and provided improved voltage regulation far superior to previous open wire constructions and other insulated cable constructions studied. In addition, their excellent moisture, heat and corrosion resistance were important assurances of maximum service life.

Okonex-Okoprene, in 3,000 to 15,000 volt constructions, was also used for trunk feeders to and from substations, tie lines and motor leads installed both aerially and underground.

To help you specify the optimum cable for your important power and control cable needs, contact your Okonite representative or write for the free Bulletin EW-1117, "How to choose insulated cable," to The Okonite Company, Passaic, New Jersey.

where there's electrical power . . . there's **OKONITE CABLE**

6339

Demise of Preferred Stock

Two authorities in the field of utility finance recently proposed the elimination of preferred stock in the capital structure. Both Donald C. Cook, Exec V.P. of American Electric Power Service Corp, and Matt L. McWhorter, Chairman, Georgia Public Service Commission, made such a proposal before the recent meeting of the Southeastern Electric Exchange.

McWhorter said, "In view of the practically default-proof record of operating utility bonds in this century, a debt ratio for an electric company of between 60 and 65% of the total capitalization should not be disturbing provided that this debt was subject to a reasonable amortization and such other technical provisions as would serve to reassure the bondholder . . . Such a structure would not provide much room for preferred stocks."

Cook presented a plan for elimination of preferred through substitution of bonds and unsecured debentures. He said, "In my opinion, the objective should be to achieve eventually a capital structure of about 55% mortgage bonds, 10% unsecured debentures, and 35% common equity."

We believe that this subject should be given very thoughtful consideration by both commissions and those who still think that preferred stock has a place in utility financing.

Fischer Black

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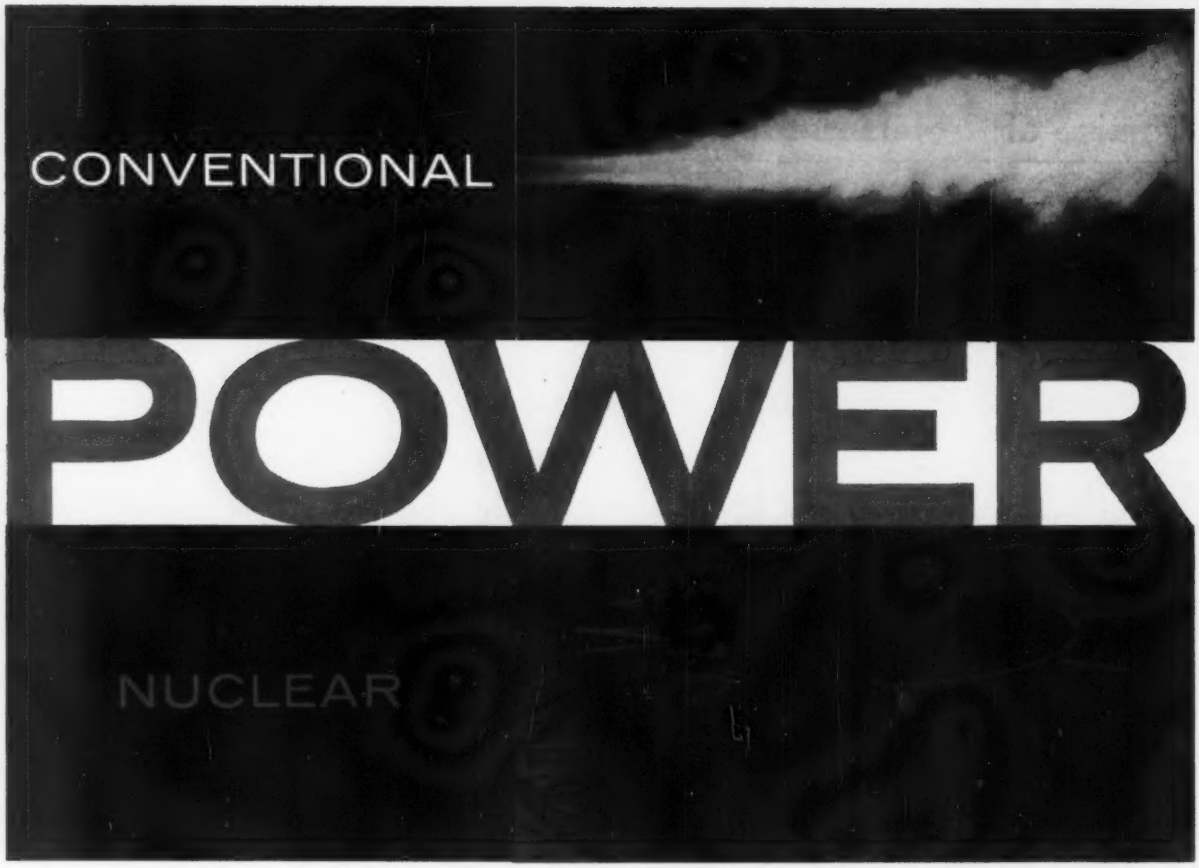

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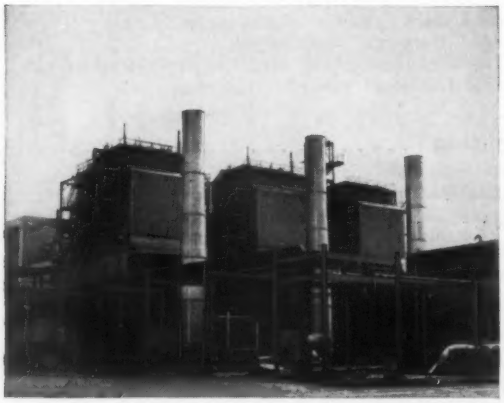

960,000 pounds/hour steam generator plant producing process steam, compressed air and 31,250 KW of electricity for alumina plant. Designed and built by KE.

A 475,000 KW power plant in Louisiana. America's Engineering Test Reactor in Idaho. A 100,000 KW industrial steam power plant in Pennsylvania. The engineering study for the AEC's Gas Cooled Graphite Moderated Power Reactor. A $10,000,000 dual-purpose process steam and power plant. New nuclear development projects in Europe, Asia and Latin America. This is Experience—electric power from both nuclear and fossil fuels. To which Kaiser Engineers couples Ingenuity to pioneer, to develop new methods, to achieve efficient plants quickly, at low cost. For experience, ingenuity, and a cost conscious approach, call or write KE. Today.

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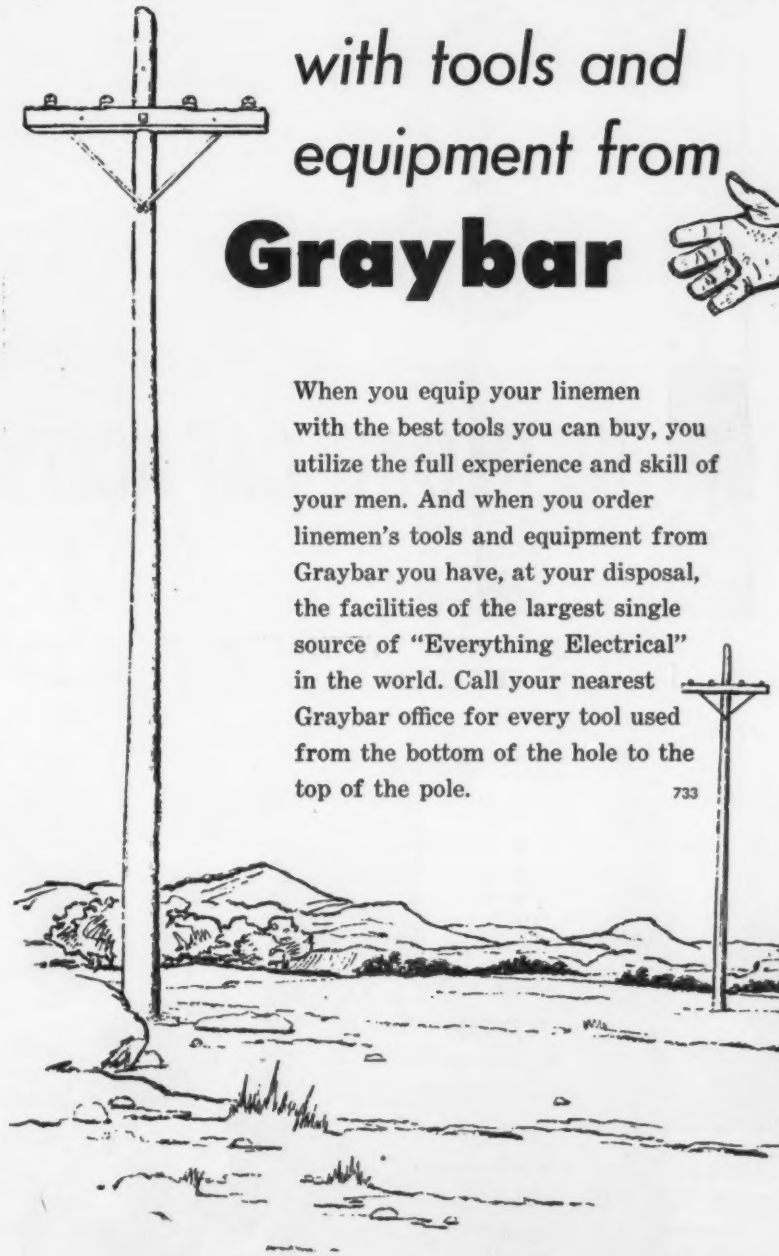

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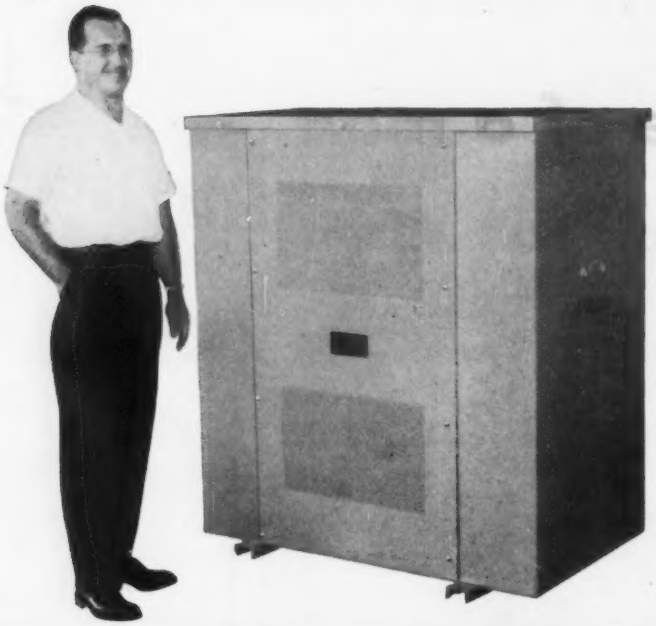
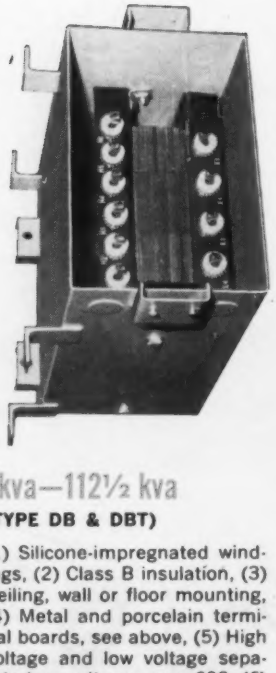


150 kva to 500 kva
(TYPE DX & DXT)

(1) Single and three phase, 4800 volts and less, (2) Class B insulation, ventilated, (3) Floor mounted, cabinet type construction, (4) Large access panels on front and back, removable cover.

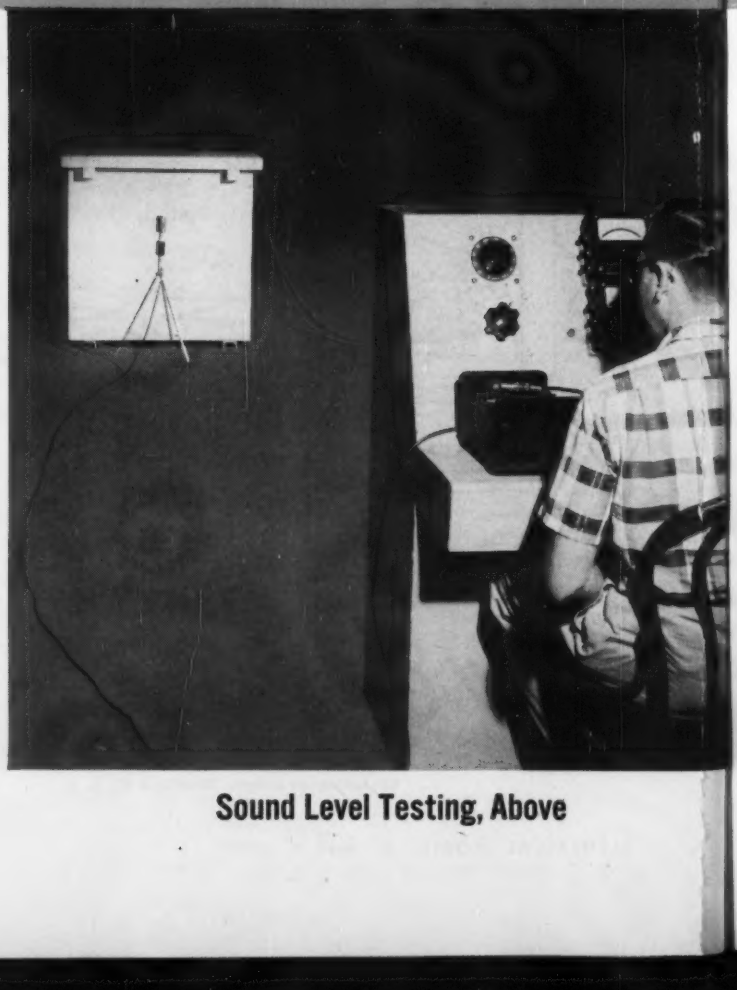
for GREATER OVERLOAD CAPACITY

DRY TYPE DISTRIBUTION TRANSFORMERS



3 kva—112½ kva
(TYPE DB & DBT)

(1) Silicone-impregnated windings, (2) Class B insulation, (3) Ceiling, wall or floor mounting, (4) Metal and porcelain terminal boards, see above, (5) High voltage and low voltage separated on voltages over 600, (6) Low sound level performance.



Sound Level Testing, Above

15 kva—112½ kva (TYPE DH & DHT)—(1) Accessible terminals and taps, in separate junction box, (see below), (2) Totally-enclosed, suitable for outdoor use, (3) Silicone-impregnated windings, (4) Class H insulation, (5) Flexibility as to mounting, (6) Low sound level.

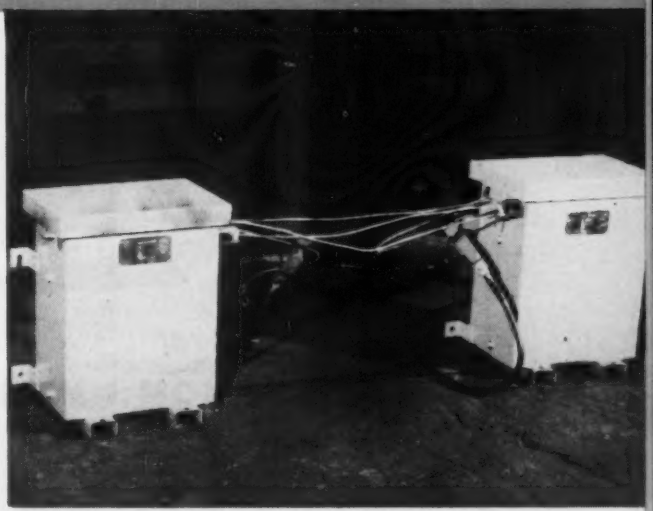
3 kva—10 kva (TYPE H)—(1) Underwriters approved, (2) Compact, wall-mounted, (3) Silicone-impregnated, (4) Class H insulation, (5) Totally-enclosed, dust-tight, (6) Accessible clamp-type terminals as seen below.

. . . and consistently high level performance

IN 4 MODERN MODELS . . . WITH ADVANCED DESIGN FEATURES

Research and product development pay off in transformers with greater overload capacity, longer life and quality performance. The improved quality of Uptegraff's line of dry type distribution transformers is the result of many years of research, persistent search for new and better materials, and engineering of the numerous design improvements listed on these pages.

Silicone-impregnated windings in all Class B types, 112½ kva and smaller, for example, provide greater overload capacity, superior moisture resistance and high temperature characteristics. Acoustical redesigning achieved quieter transformer operation. Among the many "quality control" tests is sound level analysis, seen on the left. Other tests—in addition to ASA, NEMA, and AIEE standards—assure transformers of optimum quality and performance.



Silicone-impregnated windings withstand 42% more overload. Comparative insulation tests in Uptegraff laboratories showed that transformers with silicone-impregnated windings, above right, withstood up to 42% greater overload than ordinary varnish insulation, above left. Varnish failed at 210% of rated load, silicone impregnation withstood 300% of load.

Ask for New Bulletin

Complete product specifications of the four major models, ranging from 3 kva to 500 kva, 4800 volts and less, are given in Bulletin 137-A.

R. E. UPTEGRAFF MANUFACTURING COMPANY

SCOTTDALE, PENNSYLVANIA

In 1927, Philadelphia Electric's "EHV" was 220 kv...its choice of insulators: Lapp "high-strength" suspension units

The important Conowingo-Philadelphia connection, constructed by Philadelphia Electric Co. in 1927, is a two-circuit line, on separate towers, at 220 kv. The "high-strength" insulators selected for one of these lines were Lapp 10" discs, spaced 5¾", with galvanized forged-steel caps and ball bolts, minimum M & E strength catalogued as 18,000 lbs. 32 years later, this line still is "up-to-date" in design; its original insulators are still in service "without trouble, and without reason to expect future trouble," say company officials.

IN LAPP SUSPENSION UNITS... HIGH STRENGTH AND LONG LIFE GO TOGETHER

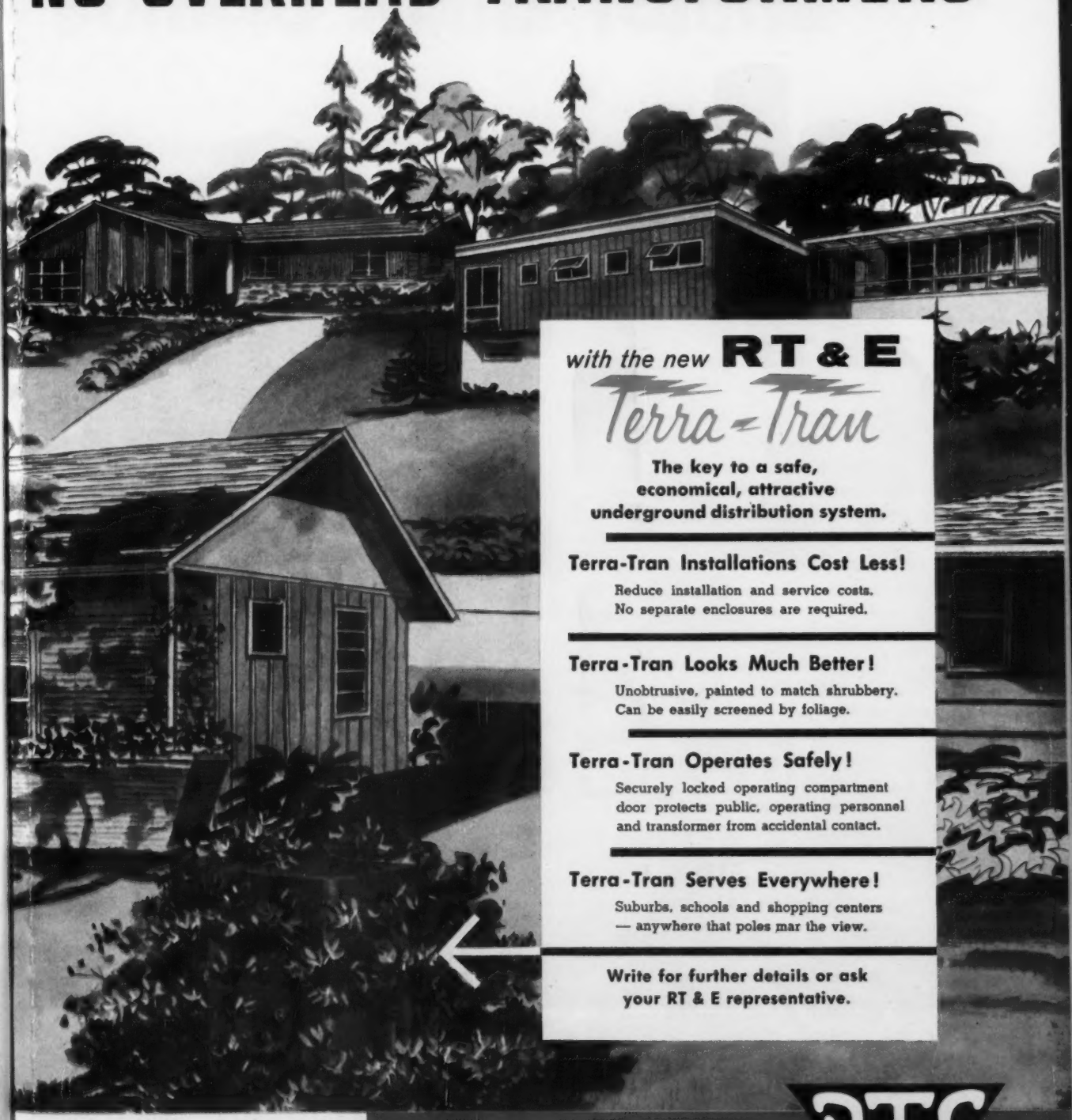
Selection of suitable insulators poses no such serious problem to designers of today's and tomorrow's EHV transmission systems as had to be faced by their predecessors of a generation ago. The principle that high strength and long life can both be built into a suspension unit, vigorously challenged through the 1920's, was established. Lapp units, built for such installations as shown above, met strength requirements; their service records prove their reliability and durability.

Lapp 25,000-lb. units are offered today for your EHV and other high-mechanical-loading requirements, both in conventional 10" discs and fog-types. Their proved design, their uniformity of mechanical and electrical characteristics and their service records merit your confidence in their selection and specification for lines of highest operating security and trouble-free long life.

Lapp

Lapp Insulator Co., Inc., Le Roy, New York.

NO POLES NO EXPOSED LINES
NO OVERHEAD TRANSFORMERS



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A BETTER TRANSFORMER

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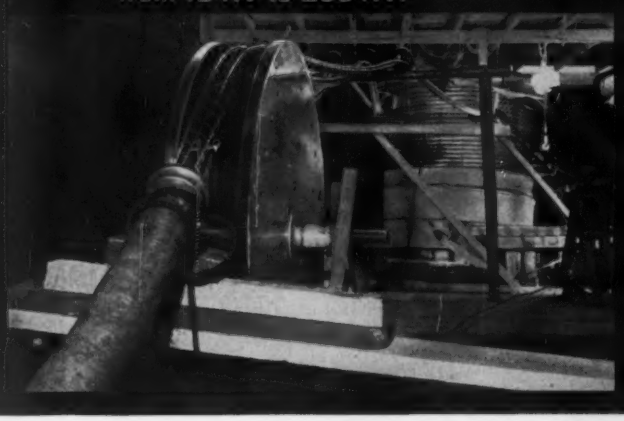
WIDEST RANGE OF HIGH

Pipe Type, Compression Cable, from 15 KV to 230 KV.



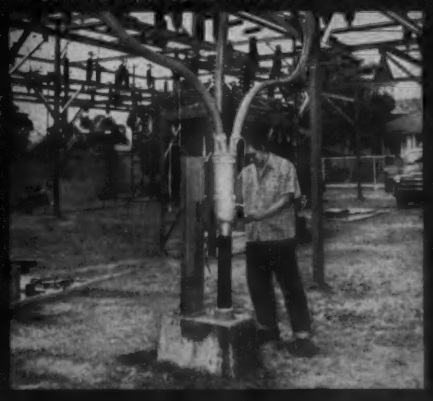
Low Pressure, Oil-Filled Cable, from 15 KV to 230 KV.

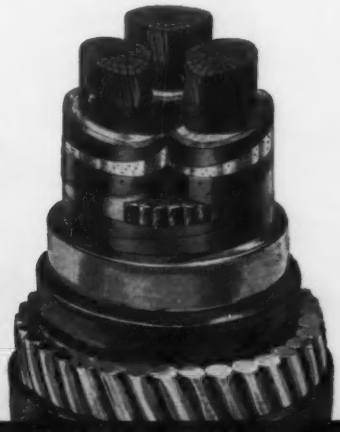
Consult Phelps Dodge for the correct answer to your requirements, regardless of voltage or type!

offers Industry's VOLTAGE POWER CABLE!

Only Phelps Dodge has manufacturing experience and operational "know how" with the entire range of high voltage cables which includes: oil compression, gas compression, high pressure oil, high pressure gas, pipe type cables; medium pressure gas, low pressure oil-filled, low pressure gas, submarine and solid type cables.

Low Pressure, Gas-Filled Cable, from 15 KV to 44 KV.





Submarine Cable, from 15* KV to 35 KV.

Solid Type Cable, from 15* KV to 69 KV.

*Lower voltage cables in this class also available.

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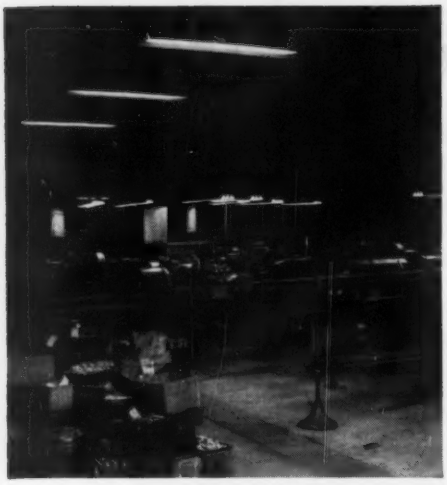

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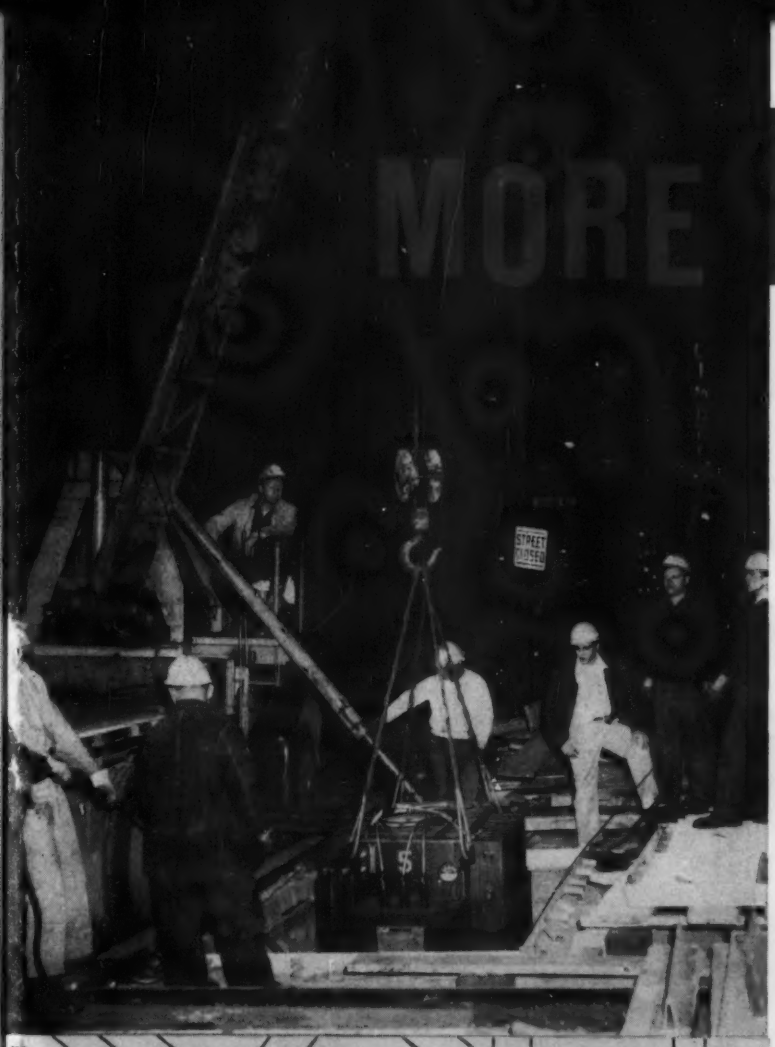
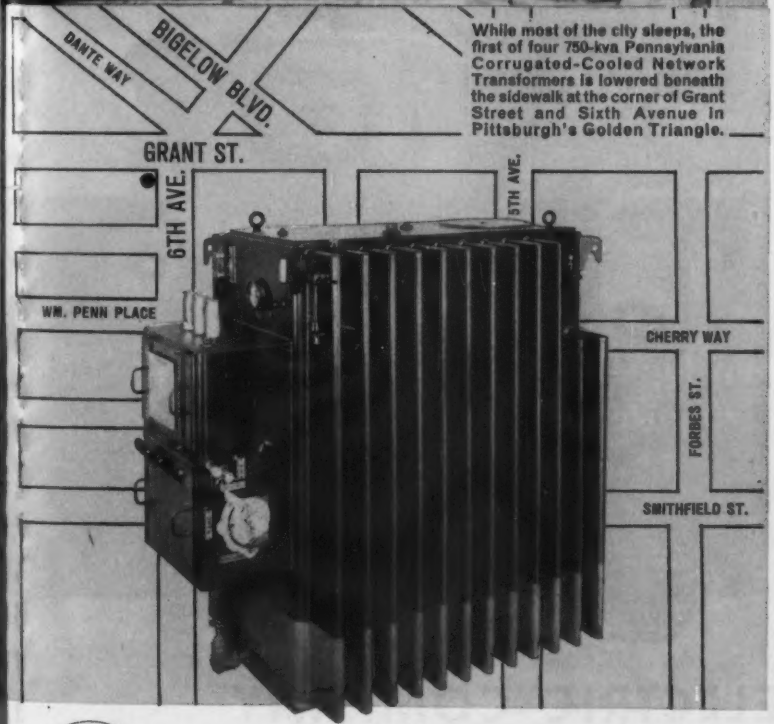




While most of the city sleeps, the first of four 750-kva Pennsylvania Corrugated-Cooled Network Transformers is lowered beneath the sidewalk at the corner of Grant Street and Sixth Avenue in Pittsburgh's Golden Triangle.

MORE POWER

goes underground for Pittsburgh's renaissance

Golden Triangle Gets New Pennsylvania Network Transformers with Corrugated Cooling

An important part of Pittsburgh's much acclaimed "renaissance" is going underground, as Duquesne Light Company installs additional power distribution equipment to meet the challenge of increasing loads in the Golden Triangle.

Beneath the sidewalk at Grant Street and Sixth Avenue, four 750-kva Pennsylvania Network Transformers have been installed to serve the lighting and power needs of one of Pittsburgh's newest skyscrapers. In keeping with other aspects of the renaissance, these transformers were designed and built with the *future* in mind. All are provided with Corrugated Cooling —the modern network transformer tank design that greatly simplifies maintenance and helps eliminate corrosion.

There are no ledges or crevices on which the corrosive materials that are characteristic of most sidewalk vault installations might collect. The smooth, straight walls of the corrugations are easy to clean and easy to paint—even from above the transformer. Coupled with the use of low-alloy, high-strength, corrosion-resistant steel, such ease of maintenance provides highly effective protection against corrosion.

Whether your own network transformer needs stem from a community renaissance or routine replacements, it will pay you to investigate the advantages of Pennsylvania Corrugated-Cooled Network Transformers. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON

PENNSYLVANIA TRANSFORMERS

PENNSYLVANIA NETWORK TRANSFORMERS

Sangamo Capacitor
ALUMINUM

Stainless Steel Cases

Strong, lightweight open type units are easy to handle during installation . . . require minimum maintenance.

50TH ANNIVERSARY SANGAMO 1900 - 1950

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Equipments with RACKS...reduce weight per KVAR as much as 11 per cent

These Sangamo capacitor equipments give you the advantages of welded structural aluminum alloy racks—*plus* stainless steel cases as standard equipment—to assure long life under all atmospheric conditions.

Less weight per KVAR makes them easier to transport, to handle, and to mount. Maintenance costs are greatly reduced because of the excellent corrosion resistance, high strength, and long service life of these equipments.

Sangamo pole-type equipments are available in In-Line, Multi-Row, and Cluster Mount assemblies in ratings from 150 to 1200 KVAR for use in distribution systems of 2.3 to 13.8 KV.

Open type equipments, composed of stacking units, are available for all high voltage applications.

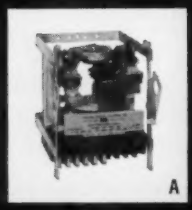
For details, consult your Sangamo Representative, or write for Bulletins 1153 and 1154.

Sangamo equipments are real "pole-savers"... light weight keeps bending moment low.

Stainless Steel Cases

PC59-2

Reliable Protective Relays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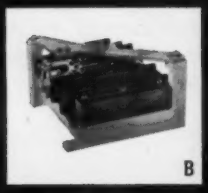
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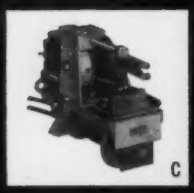
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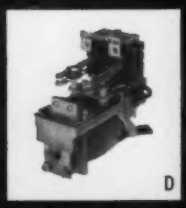
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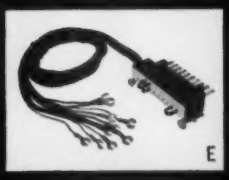

E

...the heart of quality switchgear

This proud new line of protective relays makes Federal Pacific one of only three companies able to furnish all major switchgear components, thus providing for complete quality control and undivided responsibility.

Featuring utmost reliability as well as unusual sensitivity, stability, accuracy, and simplicity, there are only three basic movements—induction disk, induction cup, and hinged armature. Any desired a-c relay characteristic can be provided through variations of the induction disk and induction cup units. What's more, these relays are designed for minimum maintenance and testing time.

A—BASIC INDUCTION DISK UNIT. Used with relays requiring adjustable time characteristics. Note separate connector on bottom which permits removal of the mechanism from the case by merely sliding it forward. No parts need be removed or wires disconnected.

B—BASIC INDUCTION CUP UNIT. This basic unit is used for instantaneous relaying applications where operating times of a cycle or less are required.

C—BASIC HINGED ARMATURE UNIT. Extremely flexible unit for use with a-c or d-c, current or voltage—with hand, self, or electrical reset contacts, circuit opening or closing, or combinations.

D—OPERATION INDICATORS. All induction relays have a combined electrical operation indicator and seal-in contactor of hinged armature design.

E—TEST PLUG. Permits complete secondary tests and checking of all connected circuits. Insertion of the plug instantly transfers relay to test circuit, removal automatically restores relay to service. Alteration of links or connections on the panel is avoided—testing is reduced to a fraction of the time normally required.

Rugged... simple... precise... and reliable. Yes, these new protective relays are worthy of your trust—as is all Federal Pacific electrical distribution and control equipment. Get the best! Write for Relay Bulletin 5-020, Federal Pacific Electric Company, General Offices: Dept. 290, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

The Electrical Week

LATE NEWS ▶ **Washington Wire** . . . FPC grants new 50-year hydro licenses to Georgia Power and Southern California Edison . . . FPC also authorizes Arizona Public Service Co to acquire system of Verde Electric Co-op.

At the American Power Conference, Chicago: Reclamation Commissioner W. A. Dexheimer says Interior Dept's position is that federal government should not accept utility responsibility for its hydro projects . . . Rockwell Mfg president W. F. Rockwell, Jr, says management needs greater understanding of the meaning of technological progress.

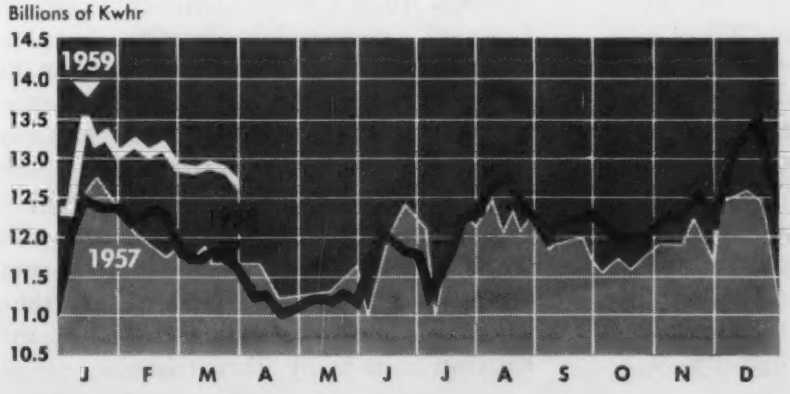
American Motors and Sonotone get into electric car business with long-range project to develop unit powered by nickel-cadmium battery.

Gulf Power and IBEW resume talks in effort to end strike. Main bone of contention is whether union shall represent foreman and control center supervisors or whether company shall continue to consider them supervisory personnel and representatives of management.

Westinghouse pres Cresap forecasts moderate new-order gains in '59 for his company at stockholder meeting in new Athens, Ga., plant.

Management changes . . . Alabama Power names D. F. Elliott and E. B. Coulbourn vps . . . A. J. Bowen is new Potomac Edison vp . . . Fluor Corp elects vps K. P. Kneubuhl, utility sales; G. H. Dieter, foreign sales; and D. S. Tappan, domestic sales . . . W. E. Chamberlain, Jr, is new vp of American Machine & Foundry . . . Remington Rand names D. L. Bibby executive vp . . . E. A. Rodrique is new assistant to president and vp of operations at Louisiana P&L . . . E. H. Coughlin (Central Louisiana Electric president) is new president, Southeastern Electric Exchange.

WEEKLY POWER OUTPUT—UP 9.1% (Week ending Mar. 28), Kwhr 12,709,000,000



Per Cent Change From Previous Year

	Mar. 14	Mar. 21	Mar. 28
Total U. S.	+ 9.6	+ 9.7	+ 9.1
New Eng.	+11.5	+ 6.5	+ 7.0
Mid. Atlantic	+ 9.2	+ 3.2	+ 7.2
Cent. Ind.	+13.5	+13.0	+12.2
West Cent.	+ 8.9	+ 8.6	+ 9.7
Southeast	+ 5.5	+ 4.2	+ 2.0
South Cent.	+12.5	+13.1	+13.4
Rocky Mount.	+ 6.1	+12.4	+15.4
Pacific			
NW	+ 6.0	+ 8.1	+ 9.8
SW	+10.8	+16.9	+17.9

Seasonally Adjusted Index 249.6

Week Ago 250.2 Year Ago 228.4

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **Long-smoldering fires along TVA's frontier may be fueled** by the bond-bill amendment that permits six cities to contract for the agency's power. Kentucky Utilities would lose about 6% of its gross revenues, Georgia Power about .4% if the changeover occurs **(p 44)** . . . With a battery breakthrough imminent, a London firm has introduced an electric car selling for $840 (about $1,000 f.o.b. in the U. S.) and weighing 1,176 lb **(p 45)** . . . A small-scale Minnesota rebellion over NRECA's Clyde Ellis' tactics may be forerunner of broader criticism **(p 45)** . . . Helicopter experiment to pour tower footing cement has been called a success by So Cal Ed **(p 46).**

ENGINEERING ▶ **More bulk power for the Piedmont Carolinas area is in the offing,** as Duke Power Co enlarges its Allen Plant on the Catawba River. The plant now has units 1 and 2 in operation, with 3, 4, and 5—raising total capacity to 1,200 Mw—to be on the line by 1961. This week's cover story on **page 56** . . . Simplification of South Carolina's E&G's McMeekin Station layout, representing a departure from usual design practice, saves $12,000 in switches **(p 50)** . . . Self-regulating distribution transformers: Just how good are they? Careful studies by Detroit Edison lead to guarded approval of SRT, but with awareness that it is new enough to still pose many unknowns **(p 52).**

Politics and Public Power

THE PERSPECTIVE FROM NEW ORLEANS

This week the approximately 2,000 people attending the 27th Annual Convention of Edison Electric Institute have converged on New Orleans. These important industry and government people, representing as they do such a large part of the utility obligation to serve, bring to that gay and most exotic of all American cities a set of problems which contrast sharply with its atmosphere.

In one way or another, almost all these problems have political implications, and it might be well to examine a few of them to help underscore those implications . . .

The challenge of Soviet Russia will loom large. The economic gauntlet which has been thrown down by Khrushchev had to have its effect on the American electric power industry. And, although that industry as a whole has given a good account of itself, politicians of all persuasions are going to get some mileage from the issue. Government-power advocates have already proposed a number of federal power schemes under the banner of necessity to "meet the growing Soviet threat." Sen John Kennedy, that unabashed presidential aspirant, has already used it in his remarks before the annual meeting of the National Rural Electric Cooperative Assn in February. Others will do likewise.

Actually, the American electric utility industry has been opening the kilowatt gap between the U.S. and the U.S.S.R., and has enjoyed a much better growth rate than the rest of our economy. New Orleans will have to point this out to the American people with the added point that such news, while it is not a cause to be smug, is refreshing at a time when we seem to be losing ground to the Russians on so many other fronts.

MANAGEMENT ▶ **Fuel plans of 248 utilities show that coal is still on top** in its competition with gas and oil for the future electric utility fuel market. The recession caused many utilities to trim their estimates of total fuel use for 1965, and stretched out the period during which they feel gas will be available as a boiler fuel. Oil has made good gains in the coastal areas, but long term, it's still coal (p 81).

MANUFACTURERS ▶ **One distribution transformer every two minutes.** That's the automated output of Westinghouse's new plant at Athens, Ga . . . Preformed Line Product Co's $1.5 million research and engineering center devoted to study of vibration and other destructive forces on overhead conductors (p 68) . . . Jasper Blackburn Corp completes current-cycling lab in St. Louis (p 70).

NEW EQUIPMENT ▶ **High-voltage bushings are interchangeable** between circuit breakers and transformers . . . Heavy-duty switch made for installations in which gang-operated switches would be impracticable because of cost . . . Load transfer control senses voltage from two sources (p 74).

SELLING ▶ **Indianapolis P&L electrically heats mobile school rooms.** Rooms use 9 kw; IP&L provides meters, connections at 45 locations (p 87).

The future role of the atom is another matter to which the convention-goers will have to address themselves. Just how big a part the privately owned electric utility industry is going to play in bringing competitively priced A-power into being is very uncertain, especially in the light of present political trends. The men at New Orleans are going to have to answer, in both words and deeds, the charges of federal A-power advocates to the effect that private industry is not capable or willing to undertake comprehensive nuclear power development, such as was leveled by Sen Clinton Anderson when Westinghouse and Pennsylvania P&L decided to drop their proposals for a large-scale homogeneous reactor: "I believe this demonstrates the fallacy of expecting private industry to provide the technical direction and financing for construction of advanced reactor concepts."

The "giant power grid" concept is sure to get the attention it deserves from speakers and conferees. The idea of a large federally owned and operated power grid to "assure development and organization of bulk power supply' is certainly not new. It has been proposed before, and has now been revived by Sen Murray's resolution for a study of the electric power supply situation. This could mean the biggest fight the private utilities have had in years.

These, then, are three of the problems the people attending the EEI convention have to live with; there are many others. The manner in which they deal with them, what they say they intend to do about them, will be watched closely by their friends, their opponents and the American people . . . whose impressions inevitably will be reflected in the political arena.

Actual business situations provide the cases for a new book designed for courses in business policy. Examples from many corporations are included in a comprehensive array of cases which aim to delineate the job of the chief executive and top management group. **"Policy Making and Executive Action," Thomas J. McNichols,** published by McGraw-Hill Book Co, New York, N. Y. 693 pages, Price $8.00.

TECHNICAL NOTES

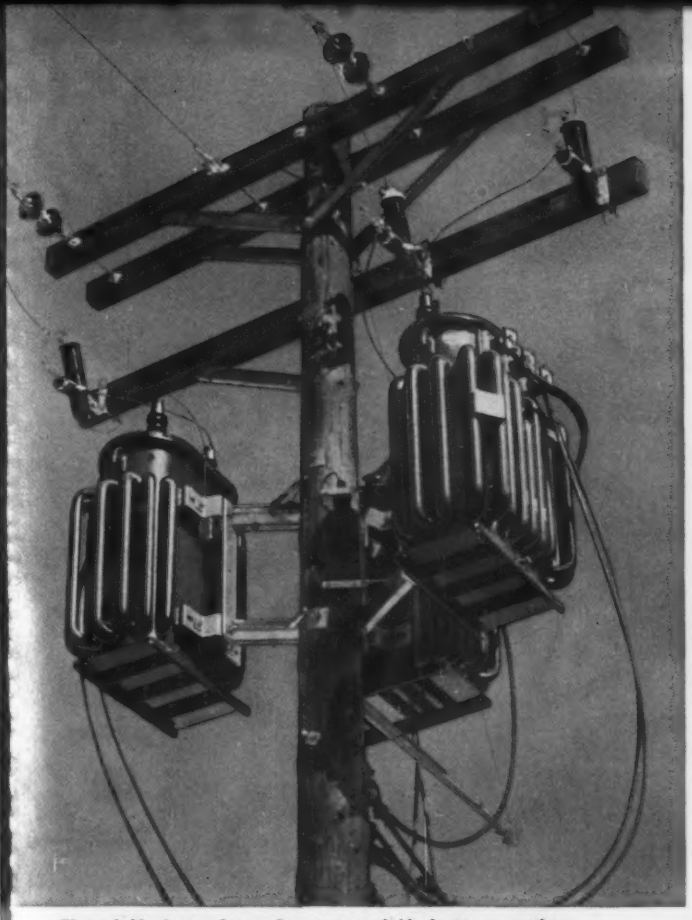
Operation at 500C for more than 500 hr is the record of a motor using an inorganic insulation made of a phosphate solution as binders with glass cloth, mica, and refractory fillers. Except for the insulation and bearings, the ½-hp induction motor is of conventional design. **C. H. Vondracek and E. J. Croop, Westinghouse Electric Corp, AIEE TP 58-1167.**

An artificial "chick" reacts to radiant heat as do live chicks and provides a sensitive device for controlling the operation of infrared brooder lamps. Cost of the fairly large sensing device and its need for servicing will limit its use to the larger hatcheries. **Agricultural Research, January, 1959, US Dept. of Agriculture.**

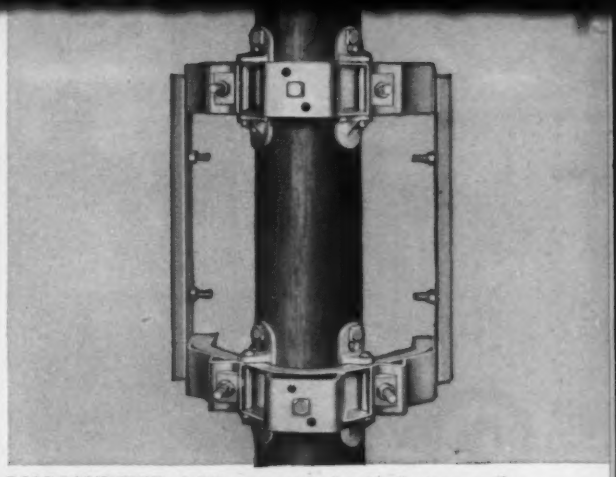
Continuous, clean and dry are three requirements for an air-supply system to provide satisfactory operation of pneumatic instruments. The observance of a few rules will prevent pneumatic instruments from strangling on moisture and contamination. **Instrumentation, January-February, 1959, Minneapolis-Honeywell Regulator Co, Philadelphia, Pa.**

Locating hydrogen in crystals of metal may be possible with neutron radiography. The wavelength properties and great penetrating power of neutrons provide this opportunity, whereas x-rays are unaffected by presence of hydrogen, practically speaking. **Frontier, Winter 1959, Armour Research Foundation.**

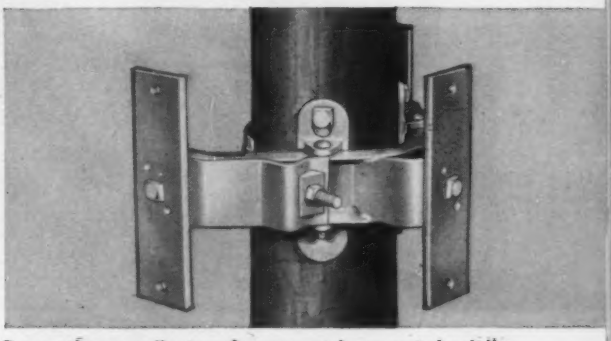
Automatic control is most commonly used for operation of small, unattended distribution substations. Economic considerations limit use of supervisory control or remote alarms for these substations. **P. M. Black, Commonwealth Edison Co, and H. W. Bliss, Rochester Gas & Electric Co, AIEE CP 59-289.**



Three L-M obround transformers, on L-M cluster mounting bracket. Note the ample climbing space that assures easy, safe access for the lineman.



POLE-BAND TYPE—L-M's newest design in cluster mounting brackets. Eliminates thru-bolts; extremely sturdy; transformers hug the pole closely; available for combinations up to three 167 kva's.

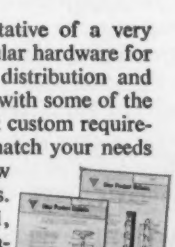


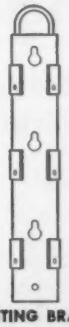
Two or three smaller transformers can be mounted solidly on this simple version of L-M Pole-Band cluster mounting.

L-M Cluster Mounting Brackets Facilitate Three-Phase Banking

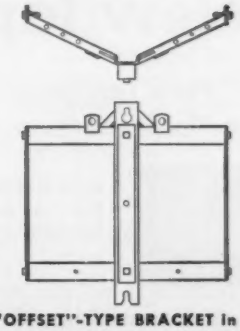
Cluster mounting of two or three transformers offers a substantial saving over cross-arm mounting, and most certainly over platform construction. L-M offers a variety of cluster mountings for two or three transformers from 3 to 167 kva. These mountings are well designed to afford maximum climbing space, with sturdy support and adequate clearance for primary connections.

These cluster mountings are representative of a very large variety of custom-designed and regular hardware for construction of primary and secondary distribution and transmission lines. If you aren't familiar with some of the items L-M has designed specially to meet custom requirements, ask the L-M Field Engineer to match your needs with L-M equipment. Or write for "New Product Bulletins" giving complete details. Line Material Industries, Milwaukee 1, Wisconsin. In Canada, Canadian Line Materials, Ltd., Toronto 13, Ontario.





DUAL MOUNTING BRACKET, for two transformers from 3 to 50 kva. A very strong, simple unit that is mounted with two machine bolts. Like all other L-M brackets, it meets EEI-NEMA standards for electrical and physical clearances. Transformers can be mounted on bracket and bracket hoisted into position with lifting eye, which exceeds 11,000-pound lift test.



"OFFSET"-TYPE BRACKET in three sizes, for transformers up to 25 kva, up to 50 kva, and up to 167 kva each. Assembled on location. Keyhole-shaped upper mounting slot facilitates installation. Provides approximately 120 degrees climbing space. EEI-NEMA electrical and physical clearances for all transformers, including those with sidewall bushings.

LINE MATERIAL Industries

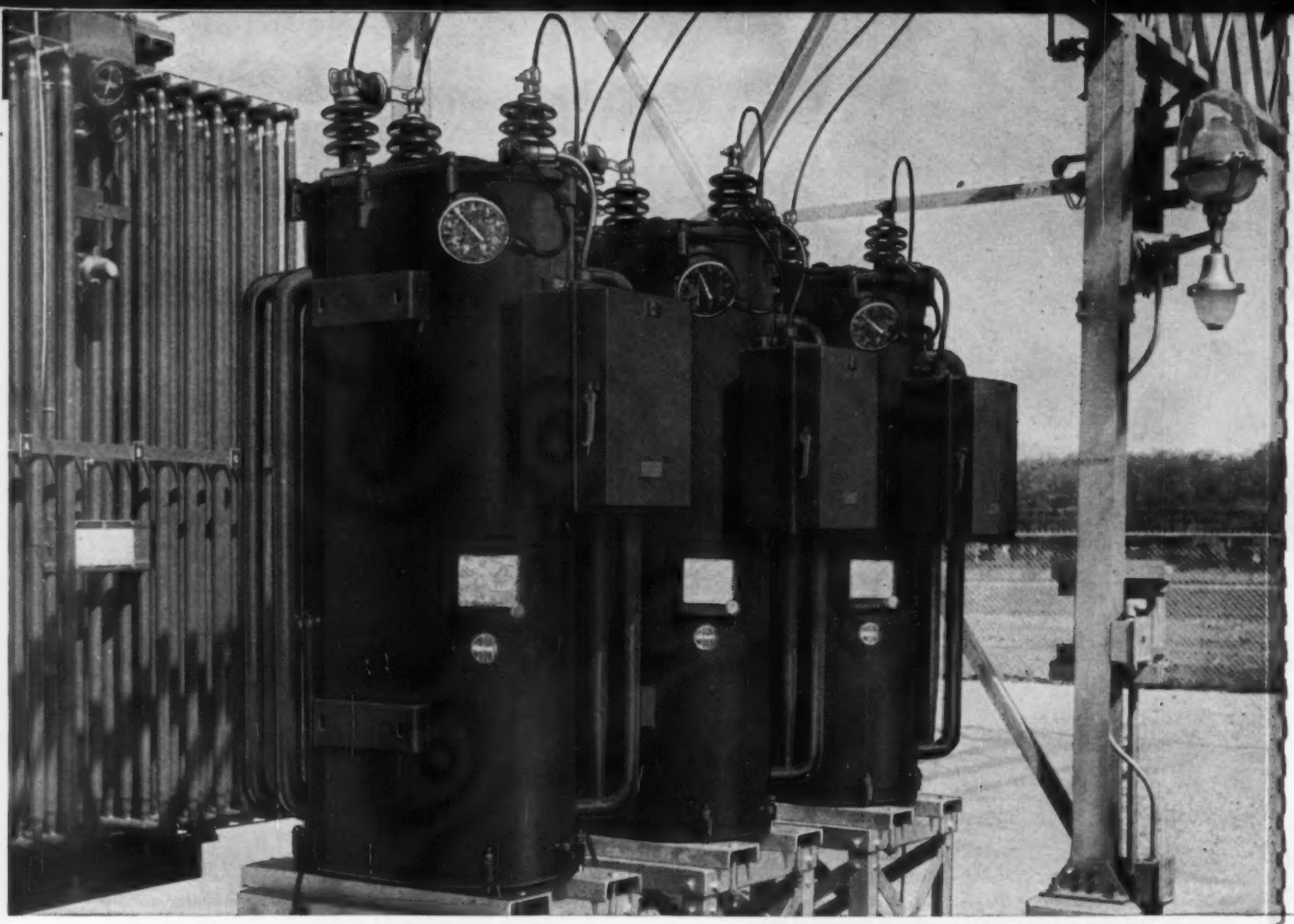
McGRAW-EDISON COMPANY

McGRAW EDISON

365

Line Construction Materials

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



L-M 32-STEP 7620 VOLT REGULATORS installed in a middle-western substation. Note the easily accessible control and easy-to-read position indicator.

The dial is tipped down to permit easy reading from the ground when regulator is pole- or platform-mounted.

L-M Announces New Ratings, New Tap Changer In 32-Step Regulator

New ratings are 300 and 400 amperes at 2500 volts; 219 amperes at 7620 volts. These are in addition to 12 ratings in 25 to 200 amperes previously offered.

By **N. K. DELANEY,** Product Manager
Capacitors and Regulators
Line Material Industries

L-M is now offering three new sizes of the Type RSD 32-step Regulators. Five more sizes available soon. All sizes include new, highly effective tap changer, and redesigned, very accurate control mechanism.

L-M RSD Regulators are designed for pole, platform, or substation application. They offer many outstanding features. Some of these are:

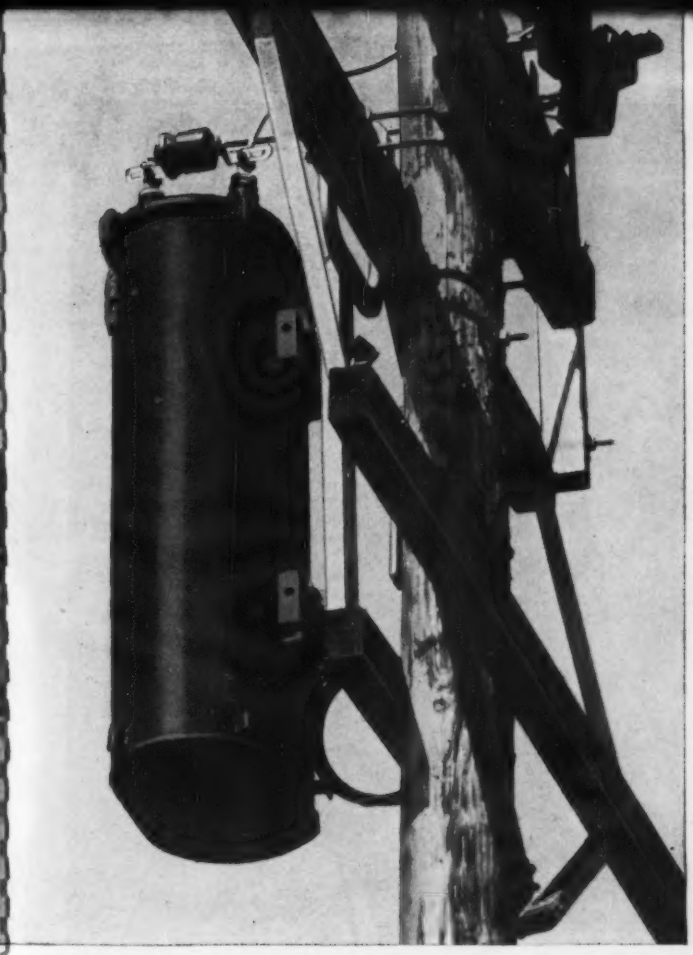
- Operation range plus or minus 10% in 32 5/8%-steps.
- Round-Wound core-coil assembly with low losses and high short-circuit strength.
- Add-Amp feature makes it possible to increase current capacity on the present line up to 160% of normal by reducing range of regulation to 5%.
- Compact design, small size, and light weight are marked advantages for pole mounting. (See Table.)
- Inspection and maintenance are simplified by cover suspension of the complete internal assembly—making untanking easy.

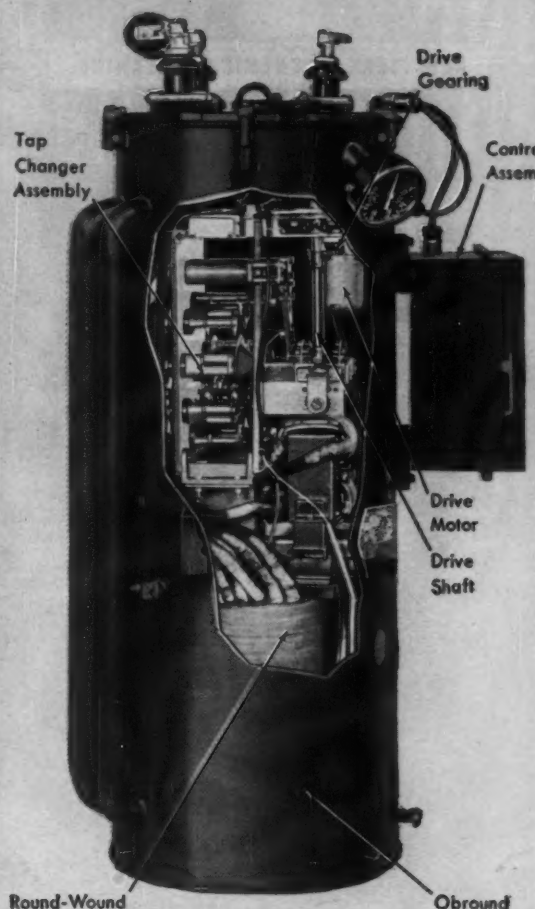
Ask for Information File, Bulletins

L-M Field Engineers make available a file of information on Regulator Application and on L-M RSD Regulators. Ask the Field Engineer who calls on your company for this data; or write Line Material Ind., Milwaukee 1, Wis.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY





INTERNAL CONSTRUCTION of the RSD Regulator. The whole unit is suspended from the cover to simplify untanking, which makes inspection and maintenance easier. Core-coil assembly at the bottom is L-M's exclusive Round-Wound design, which provides ample cooling, correspondingly higher overload capacity; balanced performance with low copper and core losses and low exciting current; high short-circuit current capacity.

All ratings can be substation or platform mounted. All but the 7620 volt, 328 ampere rating can be pole mounted. Obround design and light weight reduce the bending moment on the pole. The compact design reduces the height—very desirable for pole mounting. For example, the 7620 volt 219 ampere L-M RSD is only 83 inches high, ten to fifteen inches lower than other makes. It weighs only 2800 pounds, compared with 3000 and 4000 pounds for others. For additional height in substation mounting, elevating structures are available, adjustable in height from 24" to 36" or 36" to 48".

Look at All Three! You'll Choose the L-M Type RSD

Comparative bushing terminal heights and weights of three well-known makes:

Rating		Terminal Height, Inches			Net Weight, Pounds		
Volts	Amperes	L-M	Brand B	Brand C	L-M	Brand B	Brand C
2500	300	72	78	87	1615	1650	2250
2500	400	75	97	76	1810	3050	3100
7620	219	83	98	93	2800	3090	4000

All L-M sizes can be pole mounted. Only the 2500 volt, 300 ampere sizes of Brands B and C can be pole mounted.

Ratings Now Available		Ratings Available Soon	
Volts	Amperes	Volts	Amperes
2500	100, 150, 200, **300*** and **400***	2500	500 and 668
5000	50, 100, 150, and 200	5000	250 and 334
7620	25, 50, 75, 100, 150 and **219***	7620	328

**New Ratings*

Outstanding new tap changer. Capacitor motor; direct drive mechanism through geneva gear and scroll cam, to cam followers that provide accurate positioning of movable contacts. Two sets of movable and stationary copper-tungsten contacts which are very resistant to arc erosion. Contacts have maximum rating of 668 amperes continuous.

Regulators

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

Passes even the "white glove" inspection— Thanks to Dowell's new standard of cleanness

You may never have occasion to place "white glove" requirements to the cleanness of your process equipment, steam generators, tanks and piping. But, if you do need this high degree of cleanness, Dowell can now offer it — as an additional service — in the chemical cleaning of *your* plant equipment.

Dowell developed these new standards in cleaning the piping networks of the missile launching facilities at Cape Canaveral. Combining the research and engineering facilities of the entire company, Dowell perfected new techniques, materials and equipment to meet the necessary rigid specifications.

This new service is now adaptable for use in all types of American industry. For example, Dowell recently performed an intricate cleaning job on a 3½-mile-long buried pipeline. The customer wanted to convert the six-inch line from hydrocarbon gas to carry oxygen. For this pure product the line had to be immaculate—free of all foreign materials. The plant was faced with the alternate of laying new pipe—a six week job at a cost of $150,000.

Using their new standard of cleanness, Dowell cleaned the line of hydrocarbon residues, carbon black, grease, mill scale, and rust. Meanwhile, plant crews made mechanical alterations to the line at a cost of about $25,000. Dowell's charge was $20,000; the job was done in 3½ days.

The job was satisfactory in every way. Inspection showed the line was free of all foreign matter. The customer credited Dowell with saving them about $100,000. Also the plant made additional profits because the line was put back into use so quickly.

Ask your Dowell representative about these new standards of cleanness and their possible application to your problems. This exclusive Dowell service may save you important money. Dowell, the pioneer of chemical cleaning, has 165 offices to serve every major industrial center. Dowell, Tulsa 1, Oklahoma.

Chemical cleaning service for all industry DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

6 Ljungstroms® go to work for the city of Memphis ...and so does lifetime Air Preheater service

The City of Memphis Light, Gas and Water Division has just installed three boilers served by six Ljungstrom preheaters. Why Ljungstrom preheaters? One reason is service. Air Preheater engineers don't just wait for a call. They regularly inspect and help maintain Ljungstroms *through the life of each unit.*

What's more, Air Preheater provides rapid *factory* service in an emergency. Here's an example. A customer phoned on a Friday morning for a replacement trunnion—a major integral part of the preheaters. His Ljungstrom was 17 years old, which meant that a new trunnion had to be custom made to match his older-style. He was located 500 miles away. And he needed his boiler back on the line by Sunday.

Air Preheater went to work. Special trucking was arranged. The job was done *and shipped* that same evening. The customer had the trunnion by Saturday morning and the boiler was back on the line by Saturday evening!

Fast response to emergencies and regular inspection of Ljungstrom installations are two of the many advantages Air Preheater provides its customers. Another is expert knowledge of boiler and preheater problems —and how to lick them—gained from over 35 years of experience. Perhaps these reasons explain why 9 out of 10 preheaters sold today are Ljungstroms. For further information write today for free illustrated brochure.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Ljungstrom rotor being installed for the City of Memphis Light, Gas and Water Division. Six such Ljungstroms—each with 201,400 sq ft of heating surface—will serve three boilers. The boilers will each evaporate 2,000,000 lbs of steam/hr and have a combined nameplate capacity of 750,000 kw. A fourth boiler unit is now under consideration. Burns and Roe, Inc. designed and supervised construction.

APPALACHIAN
VIKI

THE MAN WHO HAS TO KNOW,
R. H. PORTER, SUBSTATION FOREMAN
TELLS WHY . . .

DEPENDABILITY pays dividends for Appalachian Power's investment in General Electric Voltage Regulators

"We anticipate over 25 years' dependable service from our new G-E ML-32 step regulators installed in the last few months. The first modern step voltage regulator* ever built has been operating in our Roanoke District since 1932. It didn't need major maintenance until 1956."

Dependability means most reliable operation with least-possible maintenance. This is one reason why more G-E regulators are in use today than any other make. G-E tap changer samples are continuously being life-tested to assure you of over 25 years' normal service. This long-term extra value is yours through investment in G-E regulators.

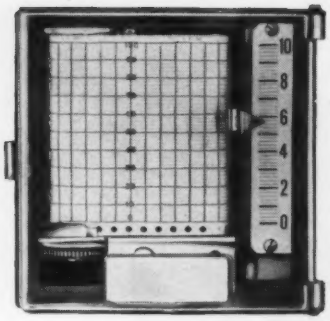
G-E REGULATORS COST LESS ON THE LINE because you get continuing extra dividends . . . from **G-E DEPENDABILITY**—absolute minimum maintenance; in **G-E SERVICE**—routine or emergency; from **G-E RESEARCH**—superior regulating equipment. Result: Extra Values = **EXTRA PROFIT.**

Only General Electric returns so much for your regulator investment. Ask your General Electric regulator representative to show you how. General Electric Co., Schenectady 5, New York. 423-35

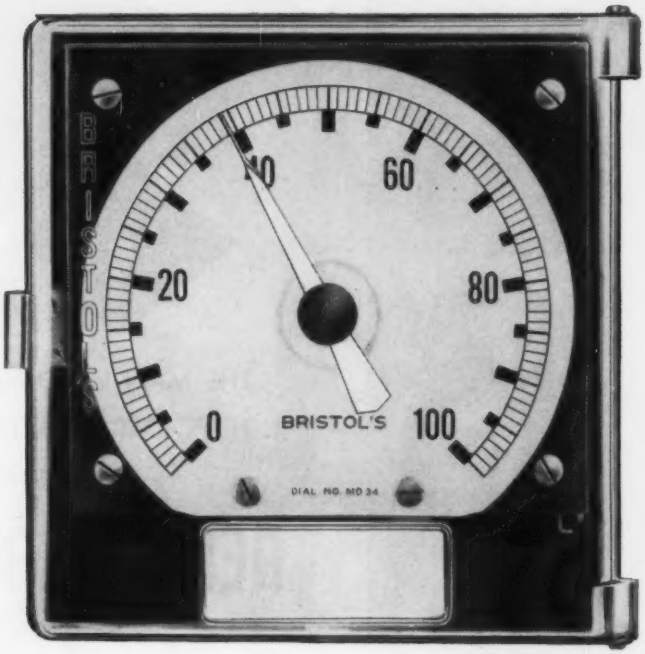
** A G-E automatic step-type voltage regulator installed in the fall of 1932 on the Roanoke-Fincastle rural distribution line of the Appalachian Power Company near Roanoke, Va.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

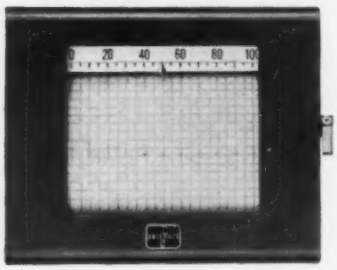


BRISTOL Indicating Electronic Dynamaster* Potentiometer and Bridge (shown below) has 8" effective scale length. Recording Electronic Dynamaster (left) has 3" chart. Panel sizes: Only 5" x 5⅛".



miniature electronic POTENTIOMETER and BRIDGE INSTRUMENTS

for nuclear power and test reactors



Large-scale Dynamaster—11" chart.

The now-famous Shippingport, Pa., Atomic Power Station... The Bristol Company is one of the instrument suppliers.

More and more reactors are going on the line under Bristol measurement and control, and they're specified for many more under construction.

Miniature Bristol Electronic Dynamaster* Indicators and Recorders, furnished as either potentiometers or bridges, can measure any variable that can be transduced to an electrical quantity... **pressure, flow, temperature, liquid level, pH, and conductivity.** Already, in the nuclear industry as in hundreds of others, these high-precision miniature instruments are establishing an outstanding record for reliability, consistent performance, and utmost flexibility. Here are just a few reasons why:

FULL PLUG-IN FLEXIBILITY. You can interchange chassis in ten seconds... replace it with either recorder or indicator instruments... both plug in easily without tools. Chassis also pulls out to intermediate position for chart changing and inking without disconnecting from circuit. Easy range change, too.

These features simplify planning of graphic control panels. Fifteen miniatures mount in less space than two full-sized units. The Bristol Company, 116 Bristol Road, Waterbury 20, Connecticut. 9.5

**T.M. Reg. U.S. Pat. Off.*

BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

How to keep a spring springy

Nothing could happen to anything as beefed-up as these compression springs used in O-B bushing assembly. Nothing . . . ? They are electrically in parallel with a copper conductor and a bronze reservoir. Most of the current can by-pass them, but *not all of it.* Being ferrous material they are subjected to hysteresis and eddy currents. These cause heat. And heat can cause slow annealment.

We might "get by" if we ignored this, but getting-by is not the fundamental of O-B bushing construction. Instead, we insulate the bottom of the reservoir and make the conductor the only live element. The springs are electrically dead as load current carrying members.

This is done by a simple insulating sleeve that prevents contact between the reservoir base and the conductor. It doesn't cost much -- until you figure how much it costs, sometimes, to learn your business.

If you like the feeling of assurance that comes with details that are understood and worked-out, this is easy to get simply by saying "O-B bushings" when you order new station apparatus.

OHIO BRASS COMPANY, MANSFIELD, OHIO

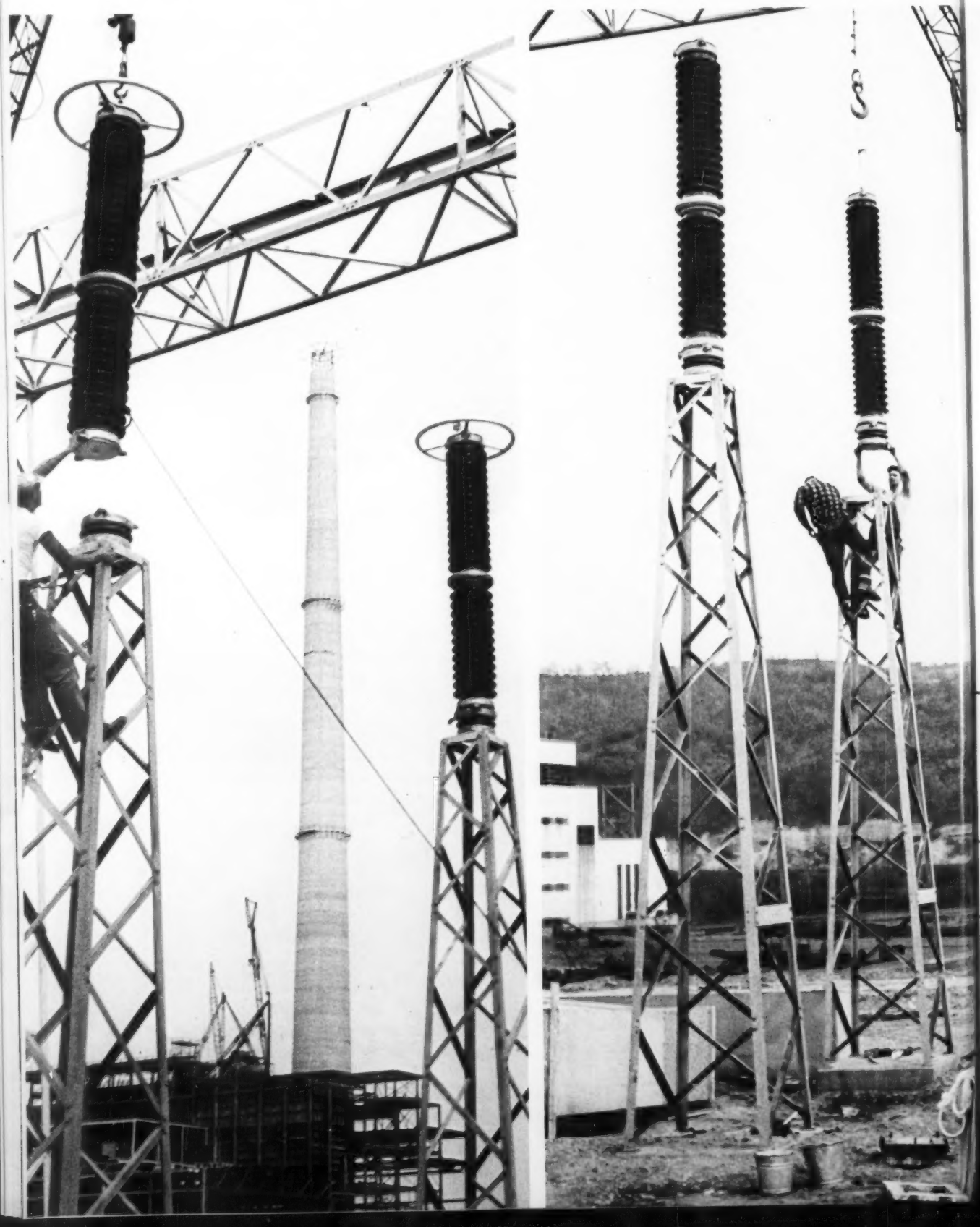
Ohio Brass

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

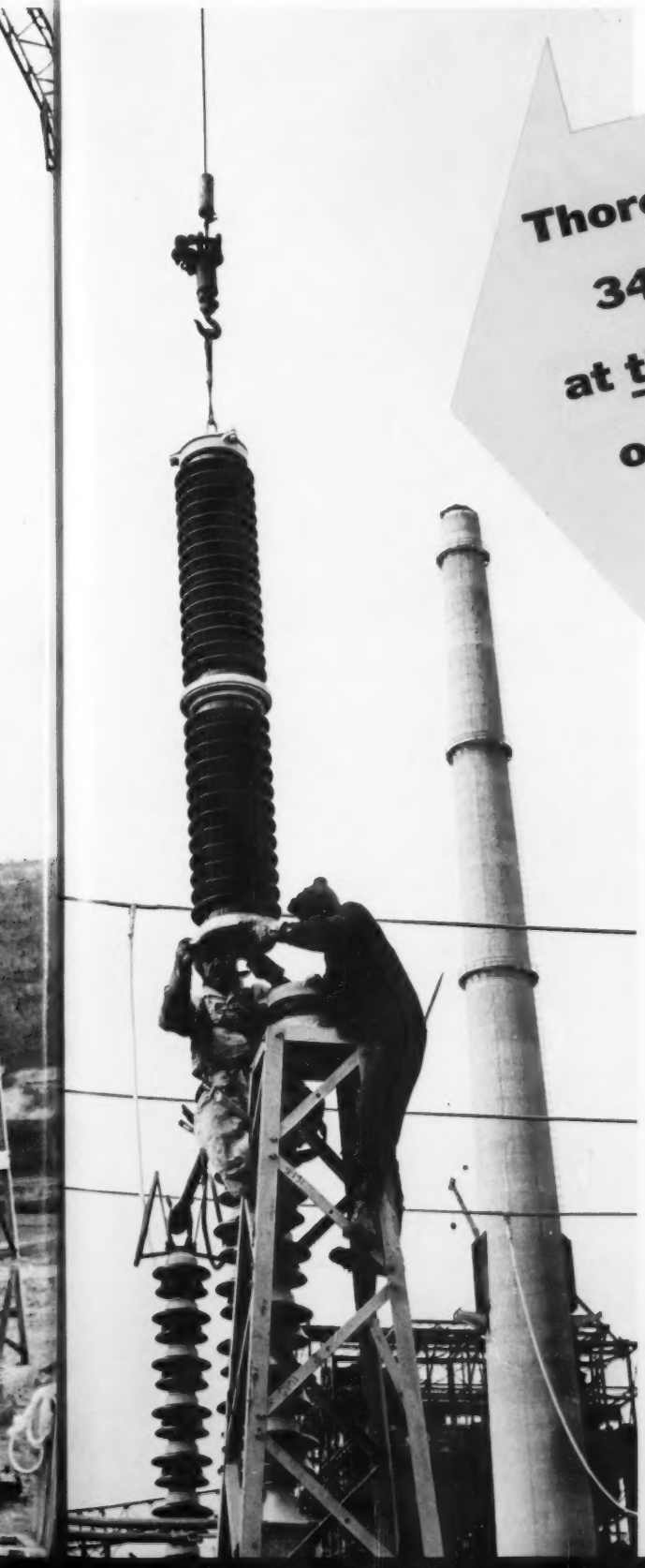
HOLAN

4925-H1

First, KAMMER – – Next, TIDD –



D — Now, BREED



Thorex arresters protect 345-kv transformers at three modern stations of major Mid-Western power network

At three major generating plants -- key supply points on a huge Mid-Western power system's 345-kv transmission network, part of it still under construction -- their main transformers are protected by Thorex Dynagap lightning arresters.

Confidence in Thorex arresters to perform this highest service duty may suggest to you the wisdom of investigating Thorex protection for *your own* vital station equipment.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
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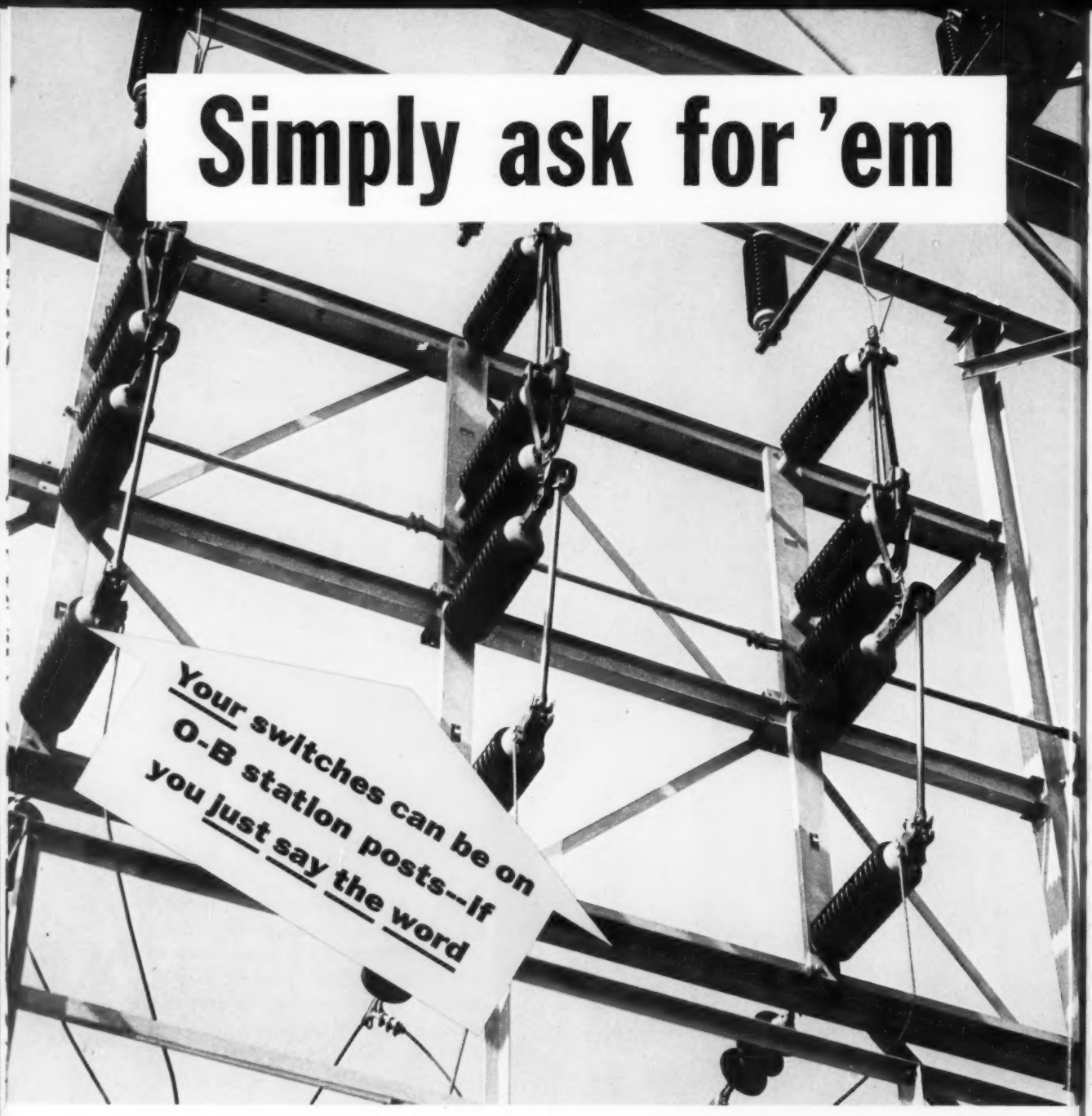
4925-H23

Simply ask for 'em



Switchgear manufacturers are glad to give you the service of supplying insulators of your choice. There is no trouble -- no price penalty. It's as easy as saying "O-B."

New equipment, new engineering development, new thinking have gone into the O-B station post -- added to a lot of old experience.

Where posts are your choice for station construction, you can make that choice O-B with complete confidence. A generation of reputation stands back of them -- another generation of trouble-free life is ahead of them! It's easy to get O-B dependability. Name it and you can have it.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

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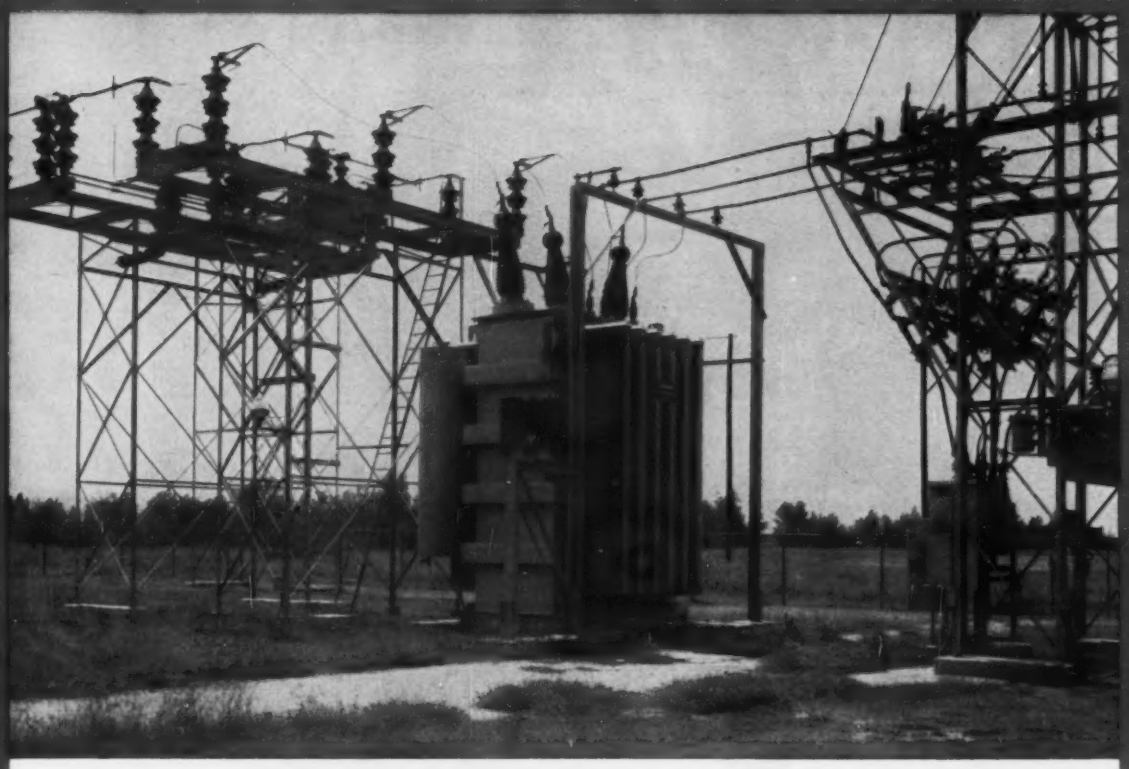
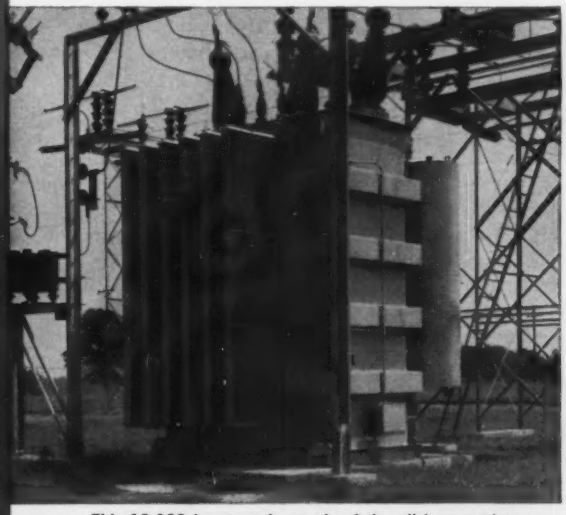
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES



ARKANSAS POWER AND LIGHT installs another WAGNER EQUIPPED SUBSTATION



This 10,000 kva transformer is of the oil-immersed type, 3 phase, 60 cycle, 55°C Rise. 115,500 v. delta to 13860Y/8000 v.

This substation, on the lines of Arkansas Power and Light Company, meets the demand for power of a new large paper mill near Pine Bluff.

To meet increasing loads and to provide always-dependable electric service, utility company planning calls for more and more transmission and distribution substations—equipped with the most dependable apparatus . . . like this 10,000 kva power transformer, one of many Wagner transformers on AP & L's lines.

Constant research and development have kept Wagner up front in transformer design for more than 65 years—made the name Wagner one of the foremost in power planning.

Wagner builds standard and special power transformers to meet practically all kva and voltage requirements. Call a nearby Wagner field engineer about your next power transformer installation. 32 branch offices are at your service.

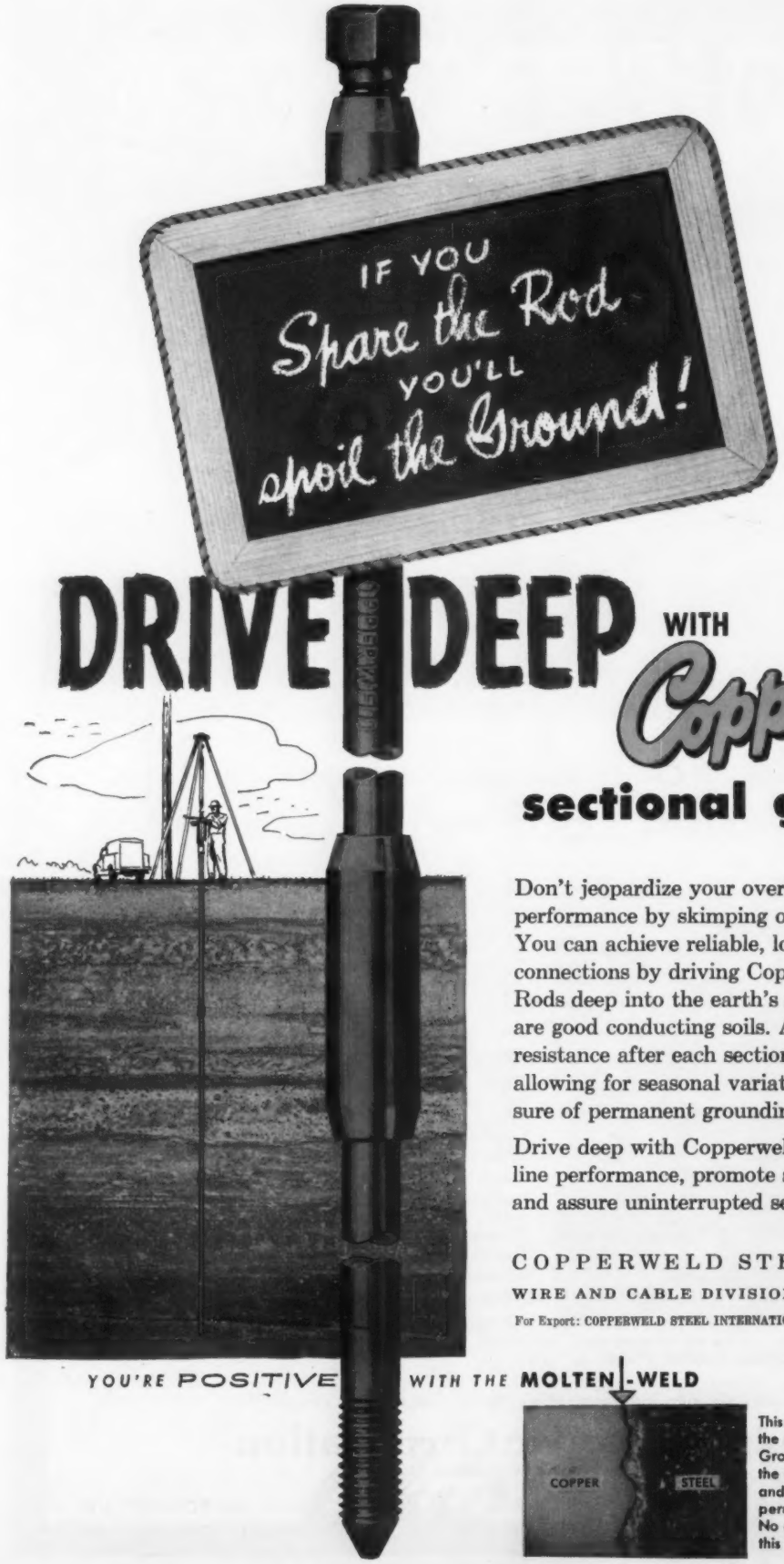
WT59-6

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6456 Plymouth Ave., St. Louis 14, Missouri.

SERVING 2 GREAT GROWTH INDUSTRIES . . . *ELECTRICAL . . . AUTOMOTIVE*



DRIVE DEEP WITH Copperweld®

sectional ground rods

Don't jeopardize your overhead line performance by skimping on ground rods. You can achieve reliable, low-resistance ground connections by driving Copperweld Sectional Ground Rods deep into the earth's sub-surface where there are good conducting soils. And by measuring resistance after each sectional rod is driven—allowing for seasonal variation—you can make sure of permanent grounding protection.

Drive deep with Copperweld! You'll improve line performance, promote safety, avoid damage, and assure uninterrupted service.

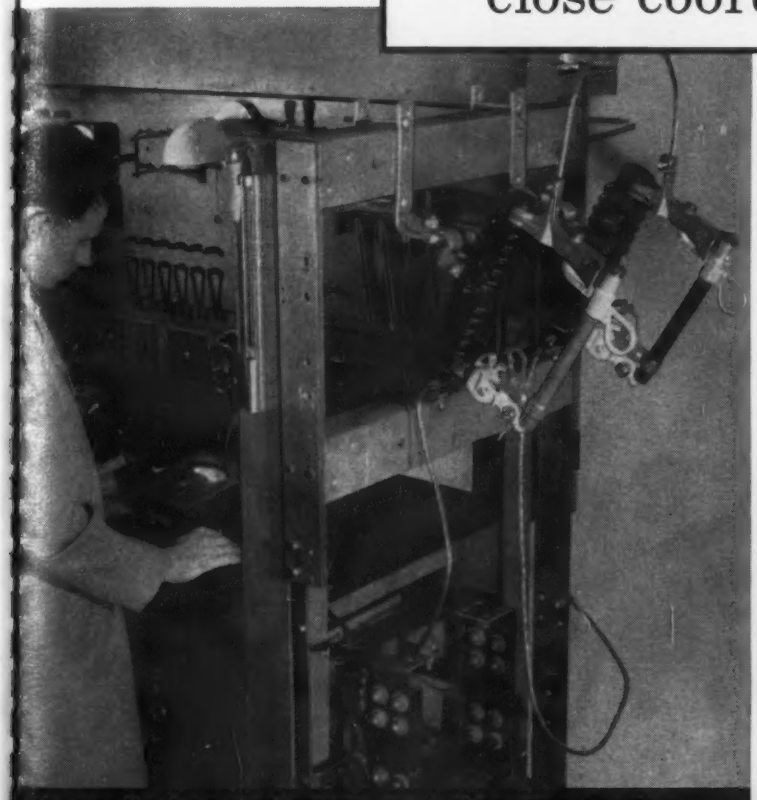
COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

YOU'RE POSITIVE WITH THE MOLTEN-WELD

This microphotograph of the weld area of Copperweld Ground Rods shows how the grains of copper and steel alloy to form a permanent, continuous weld. No other process achieves this inseparable union.

It takes KEARNEY QUALITY in Fuse Links

to give you positive protection . . . close coordination



Controlled manufacture and rigorous testing provide maximum service continuity

Quality control in KEARNEY Fuse Links starts with design . . . and continues through careful selection of materials, precision parts manufacture, expert assembly and strictest inspection and testing. The end result is dependable protection . . . uniformity that guarantees all Fuse Links of the same rating will perform exactly alike.

ALL KEARNEY Fuse Links feature low temperature operation. Pure tin elements or low melting point solder, selected for proper strength and melting temperature for each current rating, keep temperatures inside the cutout tube well below charring point. This provides accurate, positive arc clearance even after long periods of overload.

Take care of your requirements in Specialized and Standard Fuse Links with KEARNEY. Contact your KEARNEY Representative.

JAMES R. KEARNEY CORPORATION • 4224-42 Clayton Avenue • St. Louis 10, Mo.

FOR BETTER CONSTRUCTION—SAFER MAINTENANCE

Specify Kearney Products

Plants at: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

It's no secret that when coated fasteners are processed to obtain clean threads, some of the protective coating is lost. The result? Fasteners corrode *faster* than the tower members.

But fasteners coated with Bethalume—Bethlehem's new hot-dip aluminum coating—resist corrosion *longer* than the tower members.

The reason's simple. The Bethalume coating (which arms the steel with a durable, uniform layer of aluminum) has such excellent protective ability, that even after the necessary centrifuging operation to insure clean threads, there is more than adequate protection to enable the fasteners to outlast the tower members.

The results? Less rust-drip. You save the cost of touching-up. There's a safety factor to consider too. The decision to shut off power, or have painters work under hot lines, need not be made.

If you would like to know more about how Bethalume-coated bolts can hold down tower maintenance, just get in touch with your nearest Bethlehem office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
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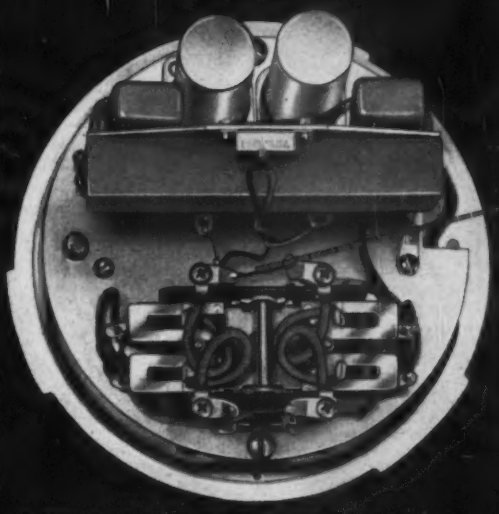
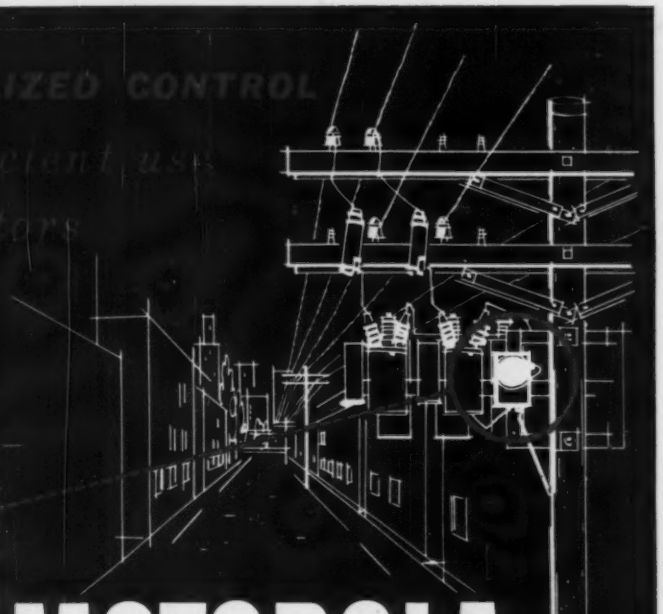
BETHLEHEM STEEL

BETHLEHEM STEEL

AUTOMATIC, CENTRALIZED CONTROL gives more efficient use of capacitors



Motorola Tone Receiver is housed in plug-in watt-hour meter case—mounts on cross arm with capacitor switches.



MOTOROLA CAPACITOR SWITCHING

Motorola Capacitor Switching is...

Simple in Operation

Code tones are carrier-imposed on the feeder lines at the central substation. These tones operate transistorized, plug-in receiver-decoder units to start programmed switching. Substation program-coder unit, accessory panels, and Motorola Power Line Carrier provide the programming, sensing and switching code transmission.

Automatic

When system voltage or reactive power exceeds preselected limits in either direction, the coder automatically sends code tones to add or remove capacitor banks from the line in a predetermined sequence.

Dependable

The new switching system embodies thoroughly proven Motorola design... and utilizes quality Motorola equipment throughout.

New Motorola Capacitor Switching will give you more efficient use of capacitor banks. Overswing of local control capacitor switching is eliminated. You lower costs with centralized control.

Here's how: optimum system balance is obtained with an extremely sensitive Sensing Device located at a central substation where total bus quantities more clearly reflect system needs. Capacitors are switched on and off in a coordinated sequence to meet entire system requirements. System balance is maintained automatically. Motorola Capacitor Switching is simple, practical and proven in use.

To find out exactly how your switching operations can be handled more dependably and economically, write for system folder today.

MOTOROLA CAPACITOR SWITCHING

Motorola Communications & Electronics, Inc., 4501 Augusta Boulevard, Chicago 51, Illinois • A Subsidiary of Motorola Inc.

Are you paying for not having full-load, full-voltage switching on your distribution feeders?

If you are opening your distribution feeders with rotating-insulator disconnects—of the two-insulator side-break or three-insulator vertical-break type—you are already *paying enough* to get full-load switching at full-line voltage (as distinguished from loop sectionalizing . . . load splitting . . . where the voltage across the switch is low).

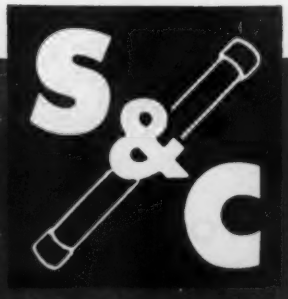
By using S & C's Side-Break Alduti Load Interrupters, you can have arc-free 600-ampere load switching through 14.4 kv at the same price, or at a lower price than you are now paying. Ordinary disconnects can, at best, only partially handle loop sectionalizing (that is, switching currents in parallel or loop circuits), let alone properly handle full-load, full-voltage switching.

Why do you need this switching capability? There are two important reasons:

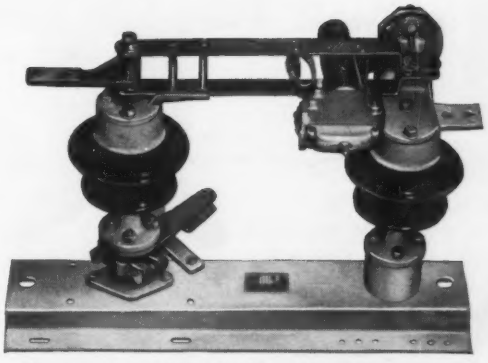
First—Emergency situations (wires down, etc.) demand quick action—dumping the load. And usually there is no time to set up communications for complicated breaker and switch sequencing.

Second—There's always the possibility of switching error, with the result that a loaded circuit may be inadvertently dumped.

If on the other hand, you are using budget-priced rocking or swiveling insulator disconnects, you may be saving on initial costs, but you are still losing the load switching capability you need. With these disconnects, or with rotating insulator disconnects, you will be paying *with trouble*—when you try to drop full load or when you try to open a heavily loaded loop.



LOAD INTERRUPTERS



Closeup view of S & C Alduti Load Interrupter (side-break style), 14.4 kv rating. May be mounted vertical, upright, or inverted.

For full information about the S & C Alduti (side-break style) and other S & C Load Interrupters, write for Catalog Section 760, S & C Electric Company, 4421 Ravenswood Ave., Chicago 40, Illinois. In Canada: S & C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ont.

S&C

Specialists in High-Voltage Circuit Interruption

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Load Interrupters
LOADBUSTER®
Disconnects
Cutouts
Fuse Links
Power Fuses
Metalclad Switchgear

Lasts and lasts...like KERITE CABLE

It's the **KERITE** *that makes the difference*

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Editorial Comment

APRIL 6, 1959

Service Voltage Recommendations Hold Promise

The standard for higher service and utilization voltage, after nearly three years of deliberation by the EEI-NEMA Joint Committee, remains "in committee." But the committee's recent preliminary report offers two recommendations which reach far toward ameliorating any later inconvenience.

One is for energetic promotion of 3-wire branch circuits in residential wiring, even where 120/240 remains the service voltage. This makes 240 v available at all outlets to supply room air conditioners and other appliances which occasionally cause starting-current problems on 120-v circuits. And it promotes use of 240-v appliances to a degree which could speed adoption of higher service voltage where overall economics are favorable.

The second recommendation is for a joint EEI-NEMA proposal seeking National Electrical Code sanction of branch circuits up to 300 v to ground for fixed appliances and room air conditioners. Favorable decision on this would eliminate a major uncertainty for utilities which might experiment with higher voltage service to heating and cooling equipment.

Both recommendations seek to clear away hurdles which must be removed before higher voltage can be applied to residential service. Early adoption would permit limited use to solve local problems today and gain experience to guide wider use of higher voltage tomorrow. They merit support.

Meetings Need the "New Look"

Fewer papers, more carefully selected, would definitely improve many industry meetings. Selection gives unity and coherence to any communication, and for engineers, technical meetings are the communication means through which they continue their education in industry. Those who attend such meetings expect to bring back to their daily tasks the information thus made available. Such exchanges of experience nourish and promote progress in the engineering arts.

But today the tendency of programmers is to choke quality with quantity and cram sessions with speakers, each delivering himself of a subject more or less cognate to session's purpose. No clearcut motivation is left with those attending the session. Furthermore, a melange of papers often deprives the audience of an opportunity to discuss a particularly valuable contribution.

Our engineering reporters are keenly aware of the absence of cohesion in the programs of the many meetings demanding their professional attention. Nor are they alone in this observation. There are hopeful signs that a change is coming. One industry association in planning its Western Electronic Show and Convention is facing up to the problem and giving its event a "new look."

Major premise of this "new look" is that three papers per session are about all a man can take at one sitting and remain alert and receptive. For each session, there will be a "panel of peers." Two or three members of this panel will come prepared to comment on each paper. What the changed "format" is expected to accomplish is stated by the 1959 convention director, Albert J. Morris:

"There should be more excitement, more direct interchange of ideas during the session, more opportunity to hear the reaction of the leaders in the field—these are the reasons for oral presentations in the first place. . . . We feel assured that this experiment will produce the kind of technical stimulation and transfer of ideas and information that such meetings are intended to impart."

Skirmishing Continues on TVA Frontier

Bond-bill amendment permits fringe area cities to be served by TVA. If it happens in KU area, effect on company's system would include loss of 6% of total revenues, Fairman says

"Nothing herein contained shall prevent the (TVA) corporation from continuing service to Dyersburg, Tenn., and Covington, Tenn., or from entering into contracts to supply or from furnishing power to the cities of Paducah, Ky., Princeton, Ky., Glasgow, Ky., Chicamauga, Ga., Ringgold, Ga., or South Fulton, Tenn., or agencies thereof."

This paragraph is from an amendment to the originally introduced TVA bond bill. By leaving the door open for six of the cities which are now served by power companies, the amendment seems certain to provide fuel for a long smoldering fire along portions of the TVA frontier.

In Kentucky, for example, the cities of Glasgow and Paducah have made previous bids to buy the local distribution property of Kentucky Utilities Co. Appraisals currently are being made or advocated on the company's facilities there and in Princeton, Ky., and South Fulton, Tenn.

7½% of Customers in Fringe Cities

The customers of these cities represent about 7½% of KU's total system, according to Floyd Fairman, the company's president. Revenue from the communities' customers accounts for some 6% of KU's total income. Since no transmission or generation expenses are involved, facilities in the cities represent only 2½% of the company's overall investment.

This relatively small slice of KU's investment and revenues isn't lessening the company's efforts to continue serving the cities.

As the company's Chairman of the Board R. M. Watt told the House Committee on Public Works: "The possibility of unregulated encroachment of one electric utility upon the service area of another is unheard of in this country, except with respect to government owned or subsidized, non-tax paying systems, and TVA, the largest of all government owned and financed electric systems, should not be permitted directly or indirectly to further encroach upon areas served by private utilities."

The committee passed the TVA bond bill last month. As amended, it would limit TVA's service area to the territory served as of July 1, 1957, with the exception of existing interconnection arrangements, Defense Dept emergency needs, and the contract proviso for the six cities.

FAIRMAN: KU won't lessen efforts

Georgia Power Co, which serves 613 customers in Ringgold and 1,090 in Chicamauga, is still determined not to sell its facilities to the cities. Gross revenues from both towns represented .391% of the company's total income during 1958.

Latest development on the local scene was the successful effort of a new Princeton electric plant board to have Gov A. B. Chandler appoint an impartial appraiser to break a deadlock in negotiations over sale of KU's system to the city.

The board's chairman, Eugene Williamson, declared, "The people want TVA power. We're going to hold along this line if it takes ten years."

He continued: "The law sets down definite steps, all of them time consuming, and all in the utilities' favor, it seems."

[Kentucky prohibits duplication of electric distribution systems.]

"We have six months to reach an agreement between our appraiser and theirs, and we don't want KU to take up the whole six months. That is why we asked for the third appraiser."

If an agreement cannot be reached, the city will file condemnation proceedings, under its right of eminent domain, in the state courts at the end of the six-month period, Williamson said.

In other developments, the city electric plant board in Paducah has formally requested KU to set a price on its holdings there. If KU does not comply, the next step will be appointment of appraisers who will then attempt to agree on a price, the board says.

Another Kentucky city, Marion, has expressed an interest in buying out KU holdings and attempting to contract for TVA power.

Gap Narrows in South Fulton

The gap between the company and South Fulton, Tenn., negotiating prices has narrowed, Fairman said. Using a reproduction-cost-new-less-depreciation formula, KU has set a $173,374 price tag on its distribution system there. Earlier, the Weakley County Municipal Electric System of neighboring Martin, Tenn., had announced plans to construct a duplicating system to serve South Fulton with TVA power.

The hassles haven't had too much impact on the company's most recent financing activity, Fairman said. Subscription rights for 206,466 shares of common were offered to the stockholders on Nov. 17, 1958 on a 1-for-12 basis at $33 per share. Last Tuesday, the price was 37¾ bid and 40⅛ asked on the Over-the-Counter market.

Fairman opined, however, that KU's proximity to TVA was responsible for an "A" rating by investment services while comparable investor-owned utilities elsewhere are classed "AA."

Battery advance brings $840 price as . . .

TEL 'Electric' Debuts in London

McGraw-Hill World News—London
A "great advance" over conventional mobile battery power plants is the feature of a new 1,176-lb plastic-bodied sedan now being manufactured by Traction Electric, Ltd, of London.

Called the TEL Electric, the small runabout has a range of about 40 mi and a top speed of 45 mph. Price in England is $840 (£300 sterling) and in the U. S. about $1,000 f.o.b. The firm has about 30 confirmed orders for the car.

U. S. Firm Negotiating Deal

The new lightweight lead-acid battery is the invention of F. L. R. Brown, managing director of Traction Electric. Since the company is negotiating a deal with an un-named American firm, Brown declines to give details of the battery.

He did say, however, that the battery is half the weight of a standard traction battery for the same output at the basic 5 or 8-hr rate of discharge, and that it maintains this advantage at higher discharge rates. Specific weight is 16-18 whr/lb, compared with 8-9 whr/lb of a conventional battery.

Although a lead-acid type, it contains no positive or negative lead grids, the active material being supported on a plastic base. And it has no separators "in the conventional sense," Brown said. The battery can be short-circuited to zero, he added.

During recharging, the battery is said to absorb a "substantial" charge in 5 to 10 min, a half charge in 30 min, and a practical charge—about 95%—in 3 hr. A built-in rectifier permits plugging in to domestic 230-250-v standard 13-amp outlet. For the U. S., Brown says, voltage can be adapted to 115 v, 16 amp, 60 cycle. The present model pulls 7,680 w for a full recharge.

Battery to Cost $140

The battery is made by Birfield Batteries, Ltd, of London, of which Brown is a director. When mass production begins, the firm aims to sell the battery for $140 or less. Present price is $224. Initial studies indicate a battery life of 4 yr.

The TEL car can have either of two transmission systems: single drive to the differential back axle or a motor in each back wheel hub.

Traction Electric has one car manufacturing plant employing between 40 and 50 workers. Its goal is to produce 30 or 40 cars a week by summer, Brown says. If the venture is successful, TEL will open other small plants, including, perhaps, one in northern Ireland where the government is offering attractive prospects for migrating manufacturing companies.

Two or three previous attempts to introduce electric cars have died natural deaths in England despite a 70¢-a-gal cost for gasoline. About 28,000 electric vehicles—most of them small trucks of up to 2-ton capacities—are in use in Britain.

Tactics of Ellis . . .

. . . draw fire of co-op director who backed Minnesota resolution for NRECA audit

A small-scale rebellion over what one member calls "the high-handed tactics" of Clyde Ellis has erupted in Minnesota. And the discontent that sparked the rebellion may be voiced before a larger audience this fall.

On March 13, at an annual meeting attended by Ellis, the Minnesota Electric Cooperative passed a resolution calling for a full financial report of NRECA activities. The measure stemmed principally from a growing resentment of the tactics of Ellis, who is NRECA's general manager, said L. M. Wagner, an MEC director.

The resolution calls for NRECA "to distribute to its members a detailed, independently audited, financial report of its receipts from all sources and disbursements for salaries, public relations, advertising, influencing legislation, travel and all other functions."

Responsibilities Neglected: Wagner

Wagner said he will attempt to push a similar resolution through at a regional convention this fall. He maintained that the national body has neglected its responsibilities to member groups.

Wagner was instrumental in passage of the resolution. He commented that Ellis seems to feel "he is representing 95% of rural America in his political outbursts. Probably the majority of NRECA members go along with him," Wagner conceded. "But this is certainly not true at the grass roots.

"Ellis has everyone pretty much under his thumb," Wagner added. "No one with any other philosophy has a chance to gain office."

Other MEC officers denied that the resolution was intended as a criticism of Ellis. "It was merely our way of trying to get a financial report into the hands of every member of NRECA," said Mrs. Genevieve Kelley, executive secretary.

Loren C. Crane, MEC vice president, added that the only discussion of the resolution came in committee, not before the state-wide association's entire membership.

The U.S. Power Picture

UE Blasts Firms, Utilities on Imports

The United Electrical, Radio & Machine Workers have put their oar into the equipment imports controversy. Their charge:

General Electric and Westinghouse lost out in recent bids to build a 500-Mw steam turbine generator for TVA because of a "profiteering policy."

The union—tossed out of the old CIO in 1950 on charges of communist domination—called for an investigation, one that would also look into the "sinister" fact that "privately-owned utilities are supporting the price gouging. . ."

"Actual difference" in labor costs between the successful TVA foreign bidder—C. A. Parsons & Co, Ltd—and the two domestic bidders "amounts to less than $91,000, which GE and Westinghouse attempted to parley into $6.3-million overbid to TVA," the union said. The 40% lower wages paid in England are offset by a 244% higher productivity level by American labor, UE spokesmen said.

Figures Based on 'Mistakes'

Westinghouse blasted right back. "UE has taken an isolated figure on man-hours of direct factory labor, which represents only a small part of the total employment costs . . . They then have multiplied this incorrect figure by an industry average wage figure which also is incorrect in the case at hand. Finally, they have applied a mythical productivity average which, they say, favors U. S. heavy electrical industry. Out of these three mistakes comes their conclusion."

The UE "suggested" why utilities were supporting domestic equipment makers on their import position:

1. "Utilities desire to see the yardstick function of TVA hampered by . . .uneconomic purchases of equipment."

2. "The divorce between the manufacturers of electric generating equipment and . . . corporations, which was ordered by the federal government some years ago, has not been fully consummated.

3. "Profit-making public utilities do not mind paying the highest prices . . . because their rates are set on the basis of a percentage of investment, and the higher their costs, the more they can charge. . ."

UE also criticized Bozell & Jacobs, Inc, for not supplying a list of 80 utilities sponsoring a "TVA Prefers Foreign Labor" release.

Helicopter Hauls, Pours Concrete for Tower Footings

Regardless of whether the test itself saves money or not, experimental use of a helicopter to pour concrete has been termed a success by Southern California Edison Co.

The company last month used the whirly-bird to pour 14 sets of footings for a mountainous 5-mi—single-circuit section of a 220-kv line. An average pouring of 8½ tons per flying hour was achieved. On the best day, the S-58 helicopter made 81 round trips and poured 32½ yd of concrete in 6 hr and 50 min flying time.

A new pick-up hook loaned by the Marine Corps contributed to success of the operation. A smaller 'copter was used to haul personnel and light hardware.

Oscar Kulberg, So Cal Ed's chief construction engineer, said that "we're trying to prove a concept" even though the S-58 wasn't designed for the trial work. He looks forward to development of Sikorsky's S-60 "flying-crane" model for even better results.

Okanagan Group, Ltd, British Columbia, provided the S-58 and crew for $300 an hour.

Private-Power Backing Sought by EEI Division

By the end of 1960, 61% of the U. S. public will favor investor-owned electric companies vs 56% favoring them two years ago. This is a goal set by the Customer Relations Committee of Edison Electric Institute at a recent meeting.

The customer relations group is a section of the recently formed Customer, Employee and Investor Relations Division, of which Charles E. Oakes, chairman of the board, Pennsylvania Power & Light Co, is chairman. Kimball I. Jack, Washington Water Power Co vice president, is head of the Customer Relations Committee. Chairman of the industrial and investor relations groups are E. J. Brill, PP&L employee relations director, and Lester E. Reynolds, Connecticut Light & Power Co's vice president and treasurer, respectively.

Donations by Companies Will Benefit Local Areas

Washington Water Power Co and Georgia Power Co have made recent contributions to communities in which they serve.

WWP donated its former downtown office building to the Spokane school district, which will use the space for administrative departments. The 4-story structure has 40,000 sq ft of space. To provide a similar facility of its own would have cost the school district $700,000.

Kinsey Robinson, WWP president, said the gift includes use of the company's nearby parking lot. "We consider this is actually a gift to the taxpayers who must bear the cost of providing good school facilities."

Groundbreaking for a new FFA-FHA camp auditorium found John J. McConough, Georgia Power president, turning the first shovelful of dirt April 1 at Jackson Lake. The company contributed $25,000 for construction of the building and an adjoining display area. This was matched by the state.

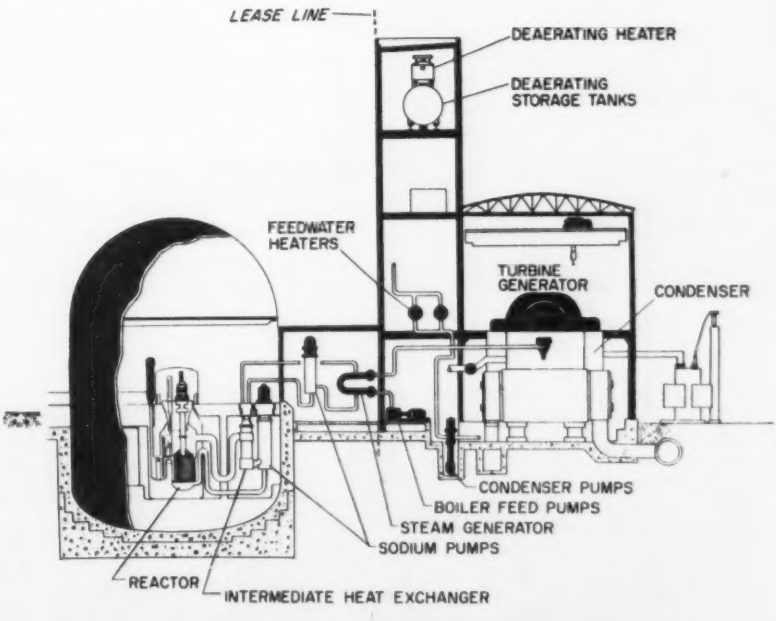
Atomic Progress

One-Step Reactor Test Strives for Superheat

A homogenous power reactor experiment is underway to produce superheated steam in one simple operation, the Atomic Energy Commission said March 25. Operational tests began March 16 at AEC's Los Alamos Scientific Laboratory, operated by the University of California.

Designated LAPRE-II, the reactor is expected to generate 1,000 kw (h). Purpose of the test is to see whether a solution of enriched uranium phosphate, phosphoric acid, and water is feasible as fuel and whether natural circulation of the solution will carry the heat to the heat exchanger.

Criticality is achieved by merely inserting liquid fuel in the core. As fuel temperature rises from 70F to 800F through nuclear reaction, the fuel volume expands 15%. This forces uranium atoms apart and reduces reactivity. When cold water is forced through the heat exchanger coils, heat is withdrawn from fuels next to coils. Lack of heat causes fuel to contract. This ups reactivity and compensates for heat loss. Fuel temperature stays about same whether or not exchanger is generating steam.



Canned Valves Vary Fermi's Coolant Flow

Reactor cooling at Enrico Fermi Atomic Power Plant will include three manually operated 6-in. valves inserted in the primary liquid sodium coolant lines leading to the blanket section. The canned valves are designed to give variable throttling without complete shutoff. Control ranges from 5 to 20% of total coolant flow.

The valves are made by Copes-Vulcan Division, Blaw-Knox Co, and are fabricated from 150-psi standard stainless steel suitable for 1,000F. The coolant enters the reactor at 550F and leaves at 800F.

Latin Americans Learn Hot Line Work

HOT LINES are worked by trainees against a backdrop of banana leaves

A&FP, A. B. Chance, Panamanian utility team up in move to help Latin Americans improve their service continuity

American & Foreign Power Co and its subsidiary, Compania Panamena de Fuerza y Luz in Panama last September sponsored two schools in hot-line work.

Many Central and South American power companies have partial hot-line maintenance programs, but lines have to be taken out of service for major repair jobs. The purpose of the schools was to acquaint Latin American linemen with hot-line methods as they are used in the U. S., and to help them adapt these tools and programs to their own structures and construction.

The schools were attended by linemen, engineers, and supervisors from nine Central and South American countries: Guatemala, Nicaragua, El Salvador, Costa Rica, Panama, Colombia, Ecuador, Brazil, and Chile. They were under direction of the Employee Relations Dept of Cia. Panamena de Fuerza y Luz in Panama City.

A. B. Chance Co furnished training personnel. Technical training was under O. G. "Andy" Anderson, Chance's tool products manager and for many years their chief hot-line tool demonstrator.

Two years of planning by A. B. Chance and A&FP preceded the training sessions. Chance distributed a new "Hot Stick Manual", printed in Spanish, to be used as text.

Panama was selected as the site because of its central location and because the host company's power lines were typical of those throughout Latin America—with structures of wood, steel, and concrete.

Invitations went out to companies of the A&FP system, those associated with the Montreal Engineering Co, Ltd, and to many independent power companies and municipal electric systems as well. Two sessions were scheduled.

Classes Move Quickly

The training sessions moved quickly from the "why you are here" remarks to classroom discussion of the tools. Each hot stick that was to be used later in the field was fully covered in the classroom first.

Selecting names for the tools that would be understood by trainees from the different countries occupied several hours of the first day.

On the second day trainees moved out to dummy structures, where they worked on straight lines, dead ends, and running corners.

Each job was worked with a normal crew. An interpreter with a portable loudspeaker relayed instructions. Four days were spent in the training area.

The last three days were devoted to actual hot-line maintenance jobs in and near Panama City. Repairs included insulator, crossarm and pole changes. To relate experience to the concrete poles so prevalent in Central and South America, all work was performed from platforms and ladders, even on wood poles.

Safety practices were followed rigidly, and all work was completed efficiently and safely.

Supervisors of the Compania Panamena de Fuerza y Luz, who worked and planned to make the program successful, were elated over the results. Trainees are expected to relay knowledge gained to their fellow workers.

OPENING DAY SESSION was spent in classroom, learning characteristics, operation, and rigging of each hotstick that was later to be used in the field work

Meter Ban Blocked; 3 Rate Cases Settled

Houston Lighting & Power Co won the first round in its court fight to keep using demand meters in Houston.

A district judge on March 23 granted a restraining order to stop the city from enforcing its demand meter ban. Company posted a $100,000 bond set by Judge Wilmer Hunt, pending a hearing on the firm's temporary injunction plea.

Attorneys for HL&P, in their court plea, claimed the city council's ban was "illegal, improper, and contrary to law." The company said removal of the demand meters would result in a loss of "not less than $500,000." Council's motion to ban the demand meters came on a 4-to-2 vote.

Other recent rate actions were:

Public Service Co of New Hampshire and New Hampshire Electric Co have been granted a total of $503,492 a year in rate increases as compared with $598,249 requested. However, in an unusual move, the New Hampshire Public Service Commission proposed to make this hike retroactive to Oct., 1958.

The PSC allowed a 5.65% rate of return on a net original cost rate base. It reduced working capital not only by the availability of regular federal income taxes, but also by the taxes deferred due to the use of accelerated amortization.

The commission allowed $1.2 million of Account 100.5, which had previously been written off by the Federal Power Commission, to be retained in the rate base. Charitable contributions were also allowed as an expense.

Another point was the PSC's denial to the state to impose an arbitrary 15% peak demand formula as a generating reserve instead of the actual one of the system.

St. Joe L&P Gets $675,000 Hike

St. Joseph Light & Power Co requested and received a rate hike of $675,000 a year by the Missouri Public Service Commission. This will produce a return of 6.5% on an original cost rate base. PSC found a fair value rate base of $33.5 million, or 21% in excess of the net original cost rate base. The return on the fair value rate base amounts to only 5.37%.

In another rate case, involving the Mountain States Telephone & Telegraph Co, the Wyoming Public Service Commission found a return of 6.75% on a net original cost rate base. However, the PSC rejected an average net investment rate base as not giving any weight to the future and stated, "It may be necessary at some future date to give recognition to the declining purchasing power of the dollar in establishing a base for fixing reasonable rates."

With respect to depreciation, while denying the use of economic depreciation because it did not permit a fair value rate, nevertheless the testimony of the company witnesses is such that it "indicates the necessity for allowing as a fair rate of return something more than the bare cost of capital."

¾ths of Canada's Feasible Hydro Power Remains to Be Tapped

The total installed capacity of Canadian hydro-electric and hydraulic stations was increased to 22,379,626 hp at the end of 1958. According to a recent study, current water power resources total more than 66-million hp, based on average stream flow conditions. This represents a feasible turbine installation of more than 87-million hp.

Thus, indications are that only about one-quarter of Canada's feasible turbine installation has been developed, according to a recent "Water Power Resources of Canada" bulletin. The report has been issued by Water Resources Branch, Department of Northern Affairs and National Resources, Ottawa.

About 78% of the total hydro and hydraulic capacity is developed by utilities and the remainder by industry, the report states. The capacity equals 1,295 hp per thousand of population. Total water power generation in 1958 was equivalent to the burning of over 45-million tons of coal. Thermal plant coal consumption last year totalled 26-million tons, the report notes.

Copies of the bulletin may be obtained free from branch's director.

Available and Developed Water Power in Canada

As of Dec. 31, 1958

Province or Territory	Available continuous power at 80% efficiency—hp: At Ordinary Min. Flow	At Ordinary 6-Month Flow	Installed Turbine Capacity hp
British Columbia	18,200,000*	19,400,000*	3,310,460
Alberta	911,000	2,453,000	312,595
Saskatchewan	550,000	1,120,000	109,835
Manitoba	3,492,000	5,798,000	778,900
Ontario	5,496,000	7,701,000	7,150,851
Quebec	10,896,000	20,445,000	9,857,607
New Brunswick	123,000	334,000	254,375
Nova Scotia	30,500	177,000	183,168
Prince Edward Island	500	3,000	1,660
Newfoundland	1,608,000	3,264,000	368,935
Yukon Territory	4,678,000*	4,700,000*	38,190
Northwest Territories	374,000	808,000	13,050
Total Canada	**46,359,000***	**66,203,000***	**22,379,626**

* Reflects effect of possible stream flow regulation based on known storage potentials.

Source: Dept. of Northern Affairs & National Resources, Water Resources Branch, "Water Resources of Canada—Bulletin No. 2641."

Split-Bus Adopted for McMeekin

Simplification of South Carolina E&G's two-generator station layout, representing departure in design practice, saves $12,000 on switches

E. P. MILLER, Electrical Engineer, South Carolina Electric & Gas Co, Columbia, S.C.

Substantial savings were made in a 13.8-115-kv generating plant substation through three changes in practices:

1. Layout was simplified by using a split-bus scheme for the two-generator station.

2. Use of two-insulator disconnecting switches instead of three-insulator air-break switches, saved about $12,000.

3. Main bus was supported on inverted vees welded to the cross buses, and these, in turn, were supported on the two-insulator disconnects. Exploiting the mechanical strength of materials, this arrangement eliminated structures, foundations, and insulators and resulted in saving about $6,000.

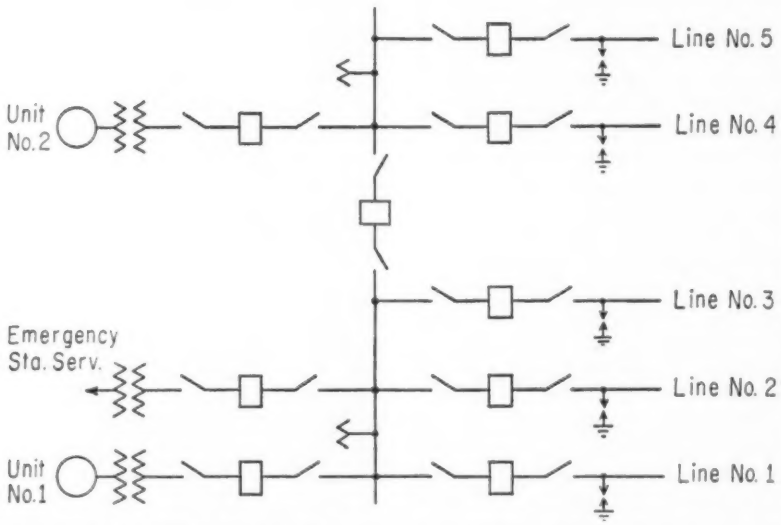


FIG 1—SINGLE-LINE DIAGRAM of Silas C. McMeekin Station shows main bus split by an oil circuit breaker, scheme considered for two-generator plant

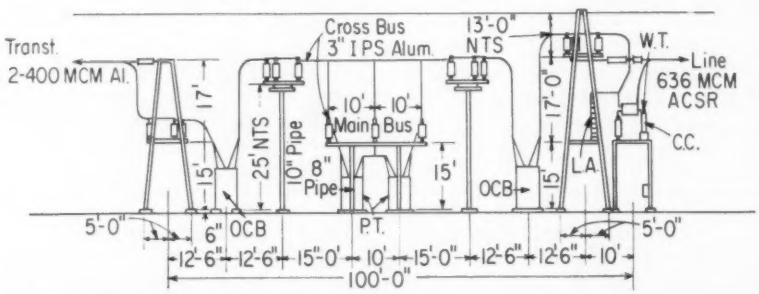


FIG 2—PROPOSED ELEVATION was found to involve too much expense because of tall structures and three-insulator air-break switches called for

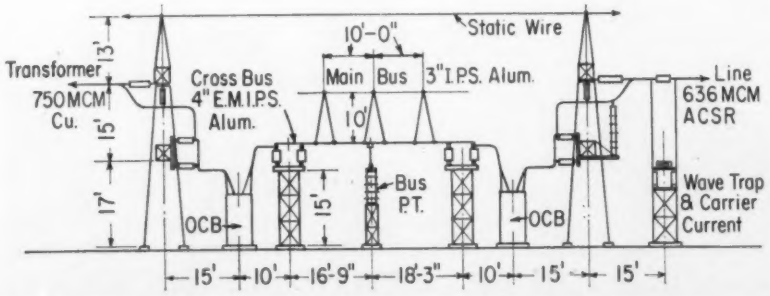


FIG 3—FINAL ELEVATION has only two tall bus structures which anchor the main bus sections at the bus-tie circuit breaker. Studies justified changes

Practices Examined

The changes stemmed from a critical examination of past practices of the engineering and operating departments in the planning of the substation at the Silas C. McMeekin Station. For this substation, engineers considered duplicating an arrangement at a few existing plants. But the double-bus scheme with selector switches on each line and transformer bank was considered unnecessary. Need for a transfer or ring bus was eliminated when the operating department decided that by-passing circuit breakers was unnecessary.

Only one concession was made to service reliability: The main bus was split by an oil circuit breaker, one generator and several lines being connected to each section. Thus, a bus fault would deprive the system of only one generator instead of shutting down the entire plant.

The general arrangement drawing shows the type and size components and the method of combining them into a substation. It was readily apparent that the three-insulator air break switches for isolating the oil circuit breakers could be replaced with two-insulator disconnecting switches.

Swapping the level of the main bus for that of the cross buses minimized the number of higher towers

required. Supporting the upper bus directly on the lower one by means of inverted vees eliminated all but two of the higher structures. These are needed to support the isolating disconnects on each side of the bus-tie circuit breaker and anchor one end of each upper bus.

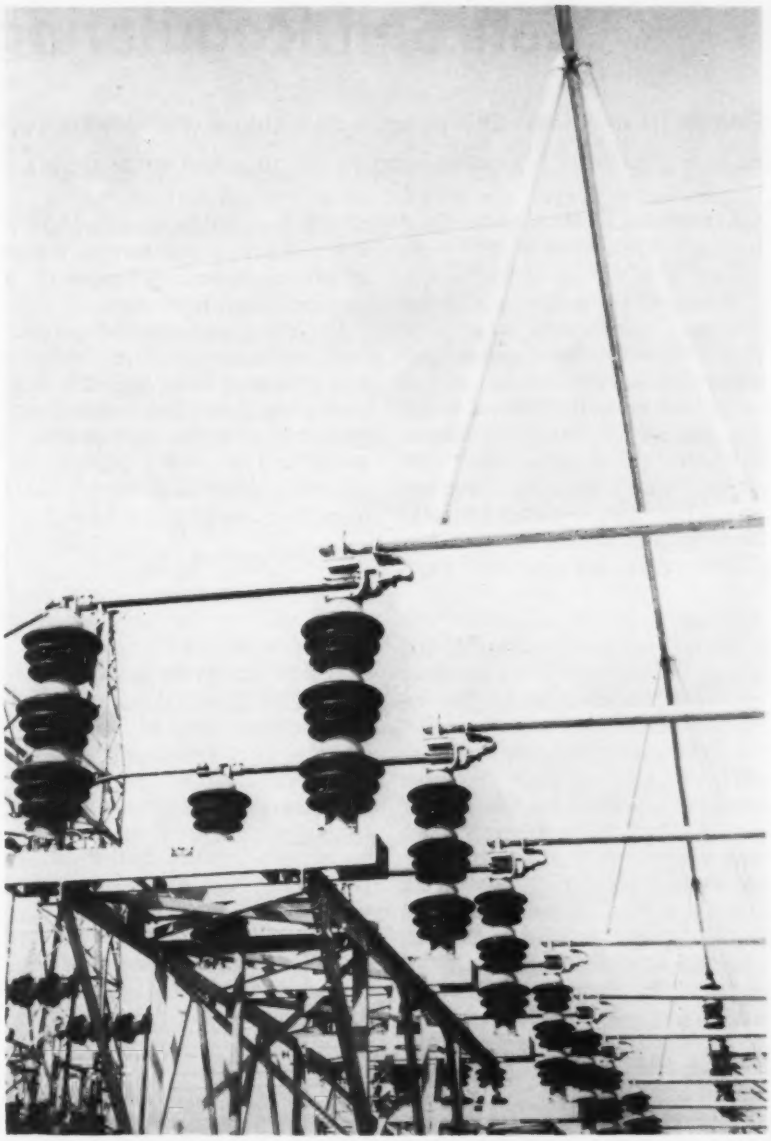
To provide the necessary strength and rigidity to support the upper bus, the lower ones had to be increased from 3-in. S.P.S. to 4-in. E.H. aluminum tubing. But the added cost of this larger tubing was more than offset by the elimination of structures, foundations, and insulators.

Supporting the 4-in. E.H. aluminum cross buses on the two insulator switches, so that the switches and supporting insulators would not be subject to damaging forces and moments, proved to be more complicated. So long as the bus is freely supported above the center of the insulator stack, no damaging moments occur.

Worked out with Bidders

Were this bus support however moved to the terminal pad, the force at this point, some 10 or 12 in. from the center of the insulator, could produce a moment large enough to damage switch or insulator. As no two switch manufacturers make identical switches, it was not practical to design a support in the specifications on which manufacturers were asked to bid. They were advised of the problem and asked to propose solutions. As no acceptable solutions were received, they were worked out later with the three low bidders. Each was given the opportunity to amend its bid to include this support.

Welding was selected as the best method of connecting aluminum buses. Consideration was given to welding entire sections of the main bus to the cross buses on the ground. Although this practice would have simplified welding, it could have resulted in poor alignment of the cross buses on the switches, producing sidewise strain on the switch insulators. The inverted vees were welded to the main bus sections on the ground, and final welds were made between the vees and the cross buses when they were in place.



SPECIAL ATTACHMENT was developed for supporting the cross buses at the center of the disconnect. Main-bus sections are supported on inverted "vees"

As the chosen method of supporting the cross buses above the center of the switch insulators did not provide a satisfactory electrical connection, a flexible connection was added between the aluminum tubing and terminal pads of the switches. This was done by welding a piece of flat aluminum to the bottom of the bus and bolting a flexible cable to it and to the terminal pad.

To obviate problems with aeolian vibration, the company incorporated a simple, inexpensive precautionary measure. A piece of 477-MCM all-aluminum cable was inserted in each piece of 3-in. IPS tubing for the main bus before they were welded together.

When the cross buses were first installed, before being connected to the main bus, considerable vibration was observed. Since the main bus was connected to the cross buses, no vibration has been noticed.

Can Self-Regulating Transformers

Due to its newness, SRT poses many unknowns, but Detroit Edison distribution studies lead to its guarded approval

E. L. LEINBACH, Distribution & Line Standards Engineer, Detroit Edison Co, Detroit, Mich.

Advent of the self-regulating distribution transformer has made available to the distribution engineer what appears to be another useful and versatile tool, yet one that poses some questions: What is its rightful place in the distribution system? Can it be used to improve service or reduce costs, or both? What are the economics in the application of the self-regulating transformer?

In an economic analysis of the problem both increased initial and a possible increase in maintenance cost must be considered. The increased initial cost is known. But the self-regulating feature upsets the old philosophy of the transformer which was posited on "no moving parts." There has not been enough time since the device's appearance to accumulate operating experience and no way of knowing what the "moving parts" involve in the way of additional maintenance. On the basis of information available, it does not appear that the regulating device, even if it became inoperable, would cause a transformer failure or present serious difficulties if it remained fixed in position.

Regarding quality of service to the customer, the self-regulating transformer appears to permit the maintenance of a more nearly uniform voltage level at the customer's service entrance than was previously possible. Nor does it appear likely to replace the standard item.

Suitable Locations Cited

The self-regulating transformer seems suitable for application at three general circuit locations:

1. On the feeder near the station where the voltage is too high and the buck range of the unit can be used to eliminate some costly double-circuit construction.

2. On the station side of pole-type regulators so that the regulator can be installed farther out on the circuit for more economical use.

3. On the tag ends of circuits to defer installation of line regulators, extension of the feeder, or other line construction.

Where self-regulating transformers are installed on the station side of the pole-type regulator, or on the tag ends of circuits, voltage improvement may result in increased revenue to the utility and improved customer service.

Detroit Edison Co has studied the probable usefulness of the self-regulating transformer and is guardedly optimistic about its possibilities on the system. More thorough studies are continuing. Quality of service to the customer should be improved, not reduced. Net cost must be equal to or less than any alternative method. In evaluating service to the customer, two factors must be considered:

1. What will be the probability of the voltage being raised above or depressed below the usable level?

2. Will the performance of appliances be improved?

The ideal situation is 119v at the outlet at all times (if 120-v lamps are used). Appliances then operate at or near peak efficiency. Resistance heating units give the best results when voltage is maintained at the proper level, and the customer gets maximum lumens from his lighting with optimum lamp life. Perhaps the self-regulating transformer will help to attain these

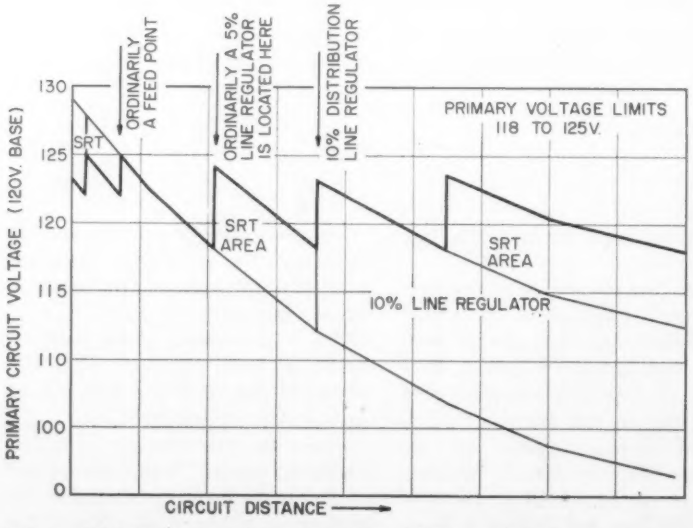


FIG 1—CURVE shows voltage gradient of SRT as placed near station, on station side of pole-type regulators, or on tag ends of circuits

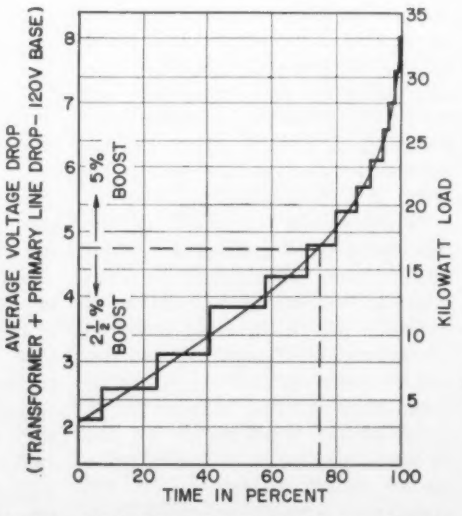


FIG 2—LOADING CURVE of 25-kva shows it operates at 2½% voltage rise 75% of time

Improve Service or Cut Costs?

Due to its newness the many unknowns of the self-regulating transformer complicate economic analysis of alternative ways of getting the same results. The unknown factors include:

1. The amount of increase in revenue expected.

2. The potential deferment of feeder reinforcement or extension, circuit rebuilds, additional circuits, or additional substations.

3. Possible reduction in capacitor banks for voltage improvement.

4. The amount of reduction in automatic switching of capacitor banks.

5. The possibility of reducing or eliminating station regulators.

6. Whether the size and/or number of pole-type regulators can be reduced.

7. The cost of the self-regulating transformer, such as record keeping, tap setting, separate stock items, extraordinary maintenance, frequent inspections, and the like.

Detroit Edison has made enough preliminary studies to determine that there are definitely some favorable factors in its use. One is the increase in revenue which may be expected. For example, the average residential customer on the system uses 3,100 kwhr per year. There is an average of 3 v drop in his service and line secondary to the secondary terminals of the transformer during his high use period.

Deliver 120 V

By setting the center of the band on 123 v, the self-regulating transformer delivers about 120 v to the customer during the peak load period. Assuming his home is well wired, he gets close to the optimum 119 v at his outlet.

According to transformer and customer load curves, the self-regulating device operates in the raise side 100% of the time. Regulation will be about 2½% rise for 75% and 5% rise for 25% of the time.

As the voltage rises, the load increases at a 1.6 rate on about 0.3 of the total kwhr. In this case the increase in use equals about 5%. Then $3{,}100 \times 0.3 \times 0.05 = 47$ additional kwhr per customer per year.

There are about 20 customers on the average 25-kva residential area transformer. The increased use of kwhr on the transformer on the foregoing basis is $20 \times 47 = 940$ kwhr per year.

The question immediately arises: How does the increase in revenue compare with the cost of the device?

The self-regulating device on a 25-kva transformer carries the following fixed annual charges:

1. Annual charges in per cent x investment.

2. An arbitrary number of dollars labeled "extraordinary maintenance."

3. An arbitrary number of dollars for cost of energy and losses.

Costs $18 Yearly

It is estimated that the self-regulating device on a 25-kva transformer on the Detroit Edison system would cost about $18 annually. The arbitrary quantities included in **2** and **3** above could be quite different in another company. For instance, if a company is buying transformers with taps, the difference in cost between the self-regulating transformer and the one normally used would be less than it would be for companies that buy transformers without taps.

The increase in revenue also depends partially on whether transformers with taps are normally used. In the Detroit Edison Co, where transformers without taps are standard, it was felt that the increased revenue due to use of the self-regulating transformers may not be enough, in itself, to justify their purchase.

A second preliminary study was made, however, to determine the possibilities of using the self-regulating transformer for deferring new construction, circuit changes, or additional equipment. In this study an existing condition was evaluated.

The area considered has the tag ends of four distribution circuits. There is no thermal problem. There will be enough load to present a voltage problem within the next year or two. The conventional method of solving this problem and overcoming future difficulties would be to build a substation with the necessary subtransmission and distribution feeders within the next year. The self-regulating transformer was considered as an intermediate step. The assumption was that 100 self-regulating transformers installed on the four circuits would take care of the voltage problem for at least a year.

Changing out the average conventional transformer for a self-regulating one would represent an extraordinary expense of about $50. Returning an assumed half of the conventional transformers after the station goes into service would add another $25 to the average installation. For one year, the cost of the self-regulating transformer is:

Annual Charges	$18
Extraordinary Labor	75
Total	$93
100 Transformers × $93 =	$9,300

From this, the increase in revenue could be subtracted to determine the net cost for one year's use of 100 self-regulating transformers.

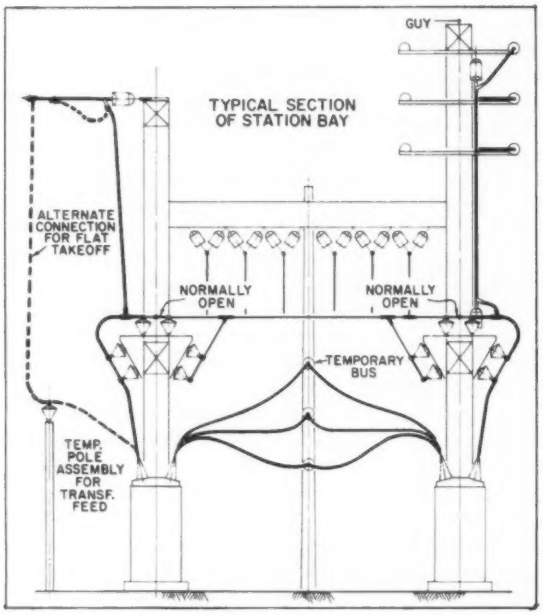
The cost of substation, the necessary subtransmission, distribution feeders, and related equipment varies widely. Even on a conservative basis, it is in the order of $100,000. A reasonable annual charge on this investment would be about $15,000. The study indicated that the self-regulating transformers to defer station construction would bring a worthwhile saving.

Improves Performance

Even in this very conservative case, a first-year saving can be realized, although extraordinary costs have been provided for. For each additional year, that the substation and lines can be deferred, there will be a much larger saving in annual changes.

Other items must, of course, be evaluated. But it appears that under certain conditions the self-regulating transformer could show a good return to the utility and continuously improved appliance performance for the customer. Each proposed use must be properly engineered and proved as good as or better than methods getting equivalent results.

Temporary Substation Bus



J. B. DOSS, General Foreman, System Transmission Line Dept, Appalachian Power Co, Bluefield, W. Va.

Substations may be given major maintenance overhauls without service interruptions by using a temporary bus scheme developed by Appalachian Power Co. The method is applicable to most structures in the 4 to 69 kv range where working conditions are normally too confined to permit maintenance work with some buses energized.

A temporary wood pole is set up at each end of the main station structure, and three conductors are strung between the poles to serve as a temporary bus. Three disk-type insulators on each pole support the conductors.

The conductors are mounted vertically for increased support and to provide greater clearance. Conductors must be heavy enough to handle the entire station load. Jumpers connect circuit breakers and transformers directly to the temporary bus, leaving the switching structure de-energized.

Use of a vertical temporary bus simplifies carrying taps from bushings to the bus. It also provides

Replace Governor Motors Quickly

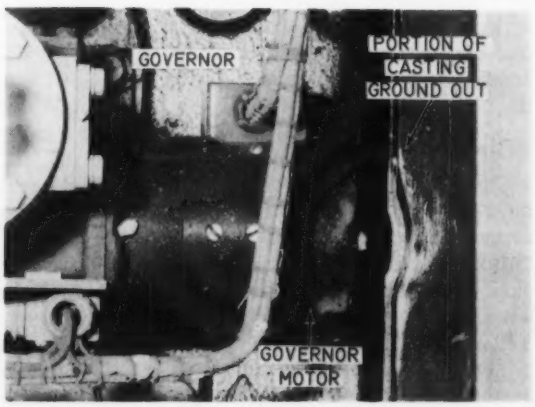
W. C. PACEY, Master Maintenance Man, Clifty Creek Station, Indiana-Kentucky Electric Corp, Madison, Ind.

A simple modification makes it possible for Indiana-Kentucky Electric Corp personnel to remove and replace governor motors on a high pressure turbine without removing the unit from service.

Replacement involved the removal of four bolts and a dowel pin from the base of the governor. The entire assembly had to be lifted about 2 in. to provide sufficient clearance to remove the driving motor.

To provide sufficient clearance, an arc is ground into the wall of the steel well casting opposite the motor end bell. A high speed right angle air grinder with a 6-in. cup wheel is used. It takes about 3 hr to grind sufficient clearance behind both the main and pre-emergency governor motors.

The larger motors now used to operate governors can be replaced simply with this modification. To



remove a motor, electrical connections are disconnected and the four motor mounting bolts taken out. The turbine remains in operation and the governor is controlled by hand until the motor repair is completed.

Others attempting a similar improvement should carefully check the wall thickness of the casting to make sure that the clearance needed for removal of a motor can be obtained. Also, the control mechanism should be covered while grinding.

Aids Service Continuity

greater clearance to inside disconnecting switches down through the structure. And it offers greater mechanical strength for the heavy conductors than could be obtained with a horizontal bus supported by crossarms.

Another short wood pole with crossarm and post-type insulators is set near the side of the switching structure just below the feed from the transformer bank that normally supplies the switching structure. This supply is connected to the insulators on the temporary pole and over to the bushings of the transformer OCB. Leads from the transformer feed, which normally go to the disconnect switches, are disconnected and pinned back.

All temporary connections from breaker bushings to the temporary bus are completed, using live-line tools and clamps, before any disconnect switches are changed from their normal operating positions. This leaves two parallel current paths. After the inside disconnect switches are opened, there is nothing energized inside the structure except the temporary bus, the OCB terminals, and the leads from the OCB terminals to the temporary bus.

After the temporary bus has been energized through the transformer OCB, temporary jumpers from the transformer are connected directly to the bank side bushings of the station breaker. Additional jumpers are connected directly from the bus side bushings to the temporary bus, by-passing both the transformer side and the bus side disconnects, leaving both main buses de-energized. Although buses and bus side disconnects are de-energized, all circuits are still protected by the OCB.

The only switches remaining "hot" are the line side disconnects on the outside of the structure. In most cases these can be de-energized by sectionalizing with line disconnects away from the station.

De-energizing sections of the station, to work on outside disconnect switches, should be done one bay at a time and just long enough to perform necessary work. All inside switches and buswork should remain de-energized throughout the duration of the maintenance program.

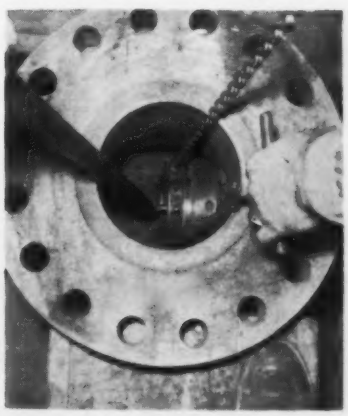
An alternative method is to use a similar external temporary bus. This has been found helpful in maintenance of substations up to 138 kv.

Chain Drive Wheel Helps Grind Valves

GEORGE MILLER, Leading Mechanic,
MELVIN STORCK, Steamfitter Foreman,
Port Washington Plant, Wisconsin Electric Power Co, Milwaukee, Wis.

Inspection and grinding of feedwater check valves and extraction heater stop valves are done easier and faster at Wisconsin Electric Power Co plants by using a simple chain drive wheel. The wheel is used to turn lapping plate disks that grind the valves.

With the 5-in. diameter wheel, two men can revolve the lapping disk up to two complete revolutions on each pull of the chain. Two ¼-in. cap screws permit the wheel to be used with any size lapping disk. A lever holds the lapping plate in place and applies the necessary pressure.



Formerly, maintenance men had to reach into the valve and turn the lapping disk by hand. Sometimes as many as three or four men were required to keep the disk turning continuously. About 48 man-hr are saved on each valve worked on with the chain drive wheel.

Allen Plant Builds for Five Units

Present two-unit output at Catawba River goes at 100 kv to nearby Charlotte and to Duke Power's 230-kv system

J. Q. WRAY JR, Assistant to Chief Engineer, Duke Power Co, Charlotte, N.C.

Allen Plant, three miles downstream on the Catawba River from Belmont, N. C., and on the backwater of the Catawba Dam, will be an important power center in Duke Power Co's system and especially for the 230-kv transmission system carrying bulk power over the Piedmont Carolinas area. When its five units are installed, it will have an ultimate capacity of 1,200 Mw. Having Units 1 and 2 in initial operation since 1957, the plant will acquire its Units 3, 4, and 5, one each year, up to 1961.

The plant is close to both the geographic and the load centers of the Duke Power system. On a 1¼-mile wide peninsula, the plant takes condensing water from the Catawba. This water is pumped through the condensers to a discharge structure and then flows through a mile-long canal to the South Fork. The discharge structure is seven water miles from the intake, and the cooling pond area at this distance is about 1,700 acres at normal reservoir level and about 1,200 acres at a 10-ft drawdown.

Half of the plant's output will go to the nearby Charlotte area at 100 kv; the other half to the new 230-kv transmission system extending 75 miles southwest, 80 miles northeast, and 50 miles northwest. Designed and constructed by Duke's engineering and construction departments, Allen Plant Units 1 and 2 were built at $103.50 per kw of continuous capability, allowing for future allocated charge of facilities built for ultimate installation.

Facilities built with Units 1 and 2 for ultimate installation include: A discharge canal with discharge structure; coal and ash storage areas; a coal unloading structure with car dumper and railroad tracks; structures for coal crushers and coal conveyors; a maintenance building for locomotives and tractors; a machine shop and storage warehouse; and a service building with offices, chemical laboratory, and testing facilities. Estimated cost of the above is $4,200,000 ($3.50 per kw of ultimate installation).

Design performance of Units 1 and 2 is 9,080 Btu per net kwhr at 1.5 in. Hg vacuum. Units 3 and 4 will have a design performance of 8,900 Btu, the first units below the 9,000 Btu per kwhr level. All units will operate with steam conditions of 2,400 lb and 1,050 F with reheat to 1,000 F. The plant enclosure above ground consists of sheets of fluted aluminum attached to steel girts. The enclosures were designed to help defray part of the cost, that is, by enclosing the forced-draft fans, so that they take the combustion air supply from the top of the boiler room, they use the waste heat.

All boilers are equipped with electrically operated automatic sequential soot blowers using steam as a blowing medium. Boilers of Units 1 and 2, are equipped with mechanical collectors. As tested, the efficiency of the collectors was about 85%.

Units 3 and 4 will have all-electric precipitators with a guaranteed efficiency of 97%. The precipitators will have automatic voltage control, the power supply being from silicon

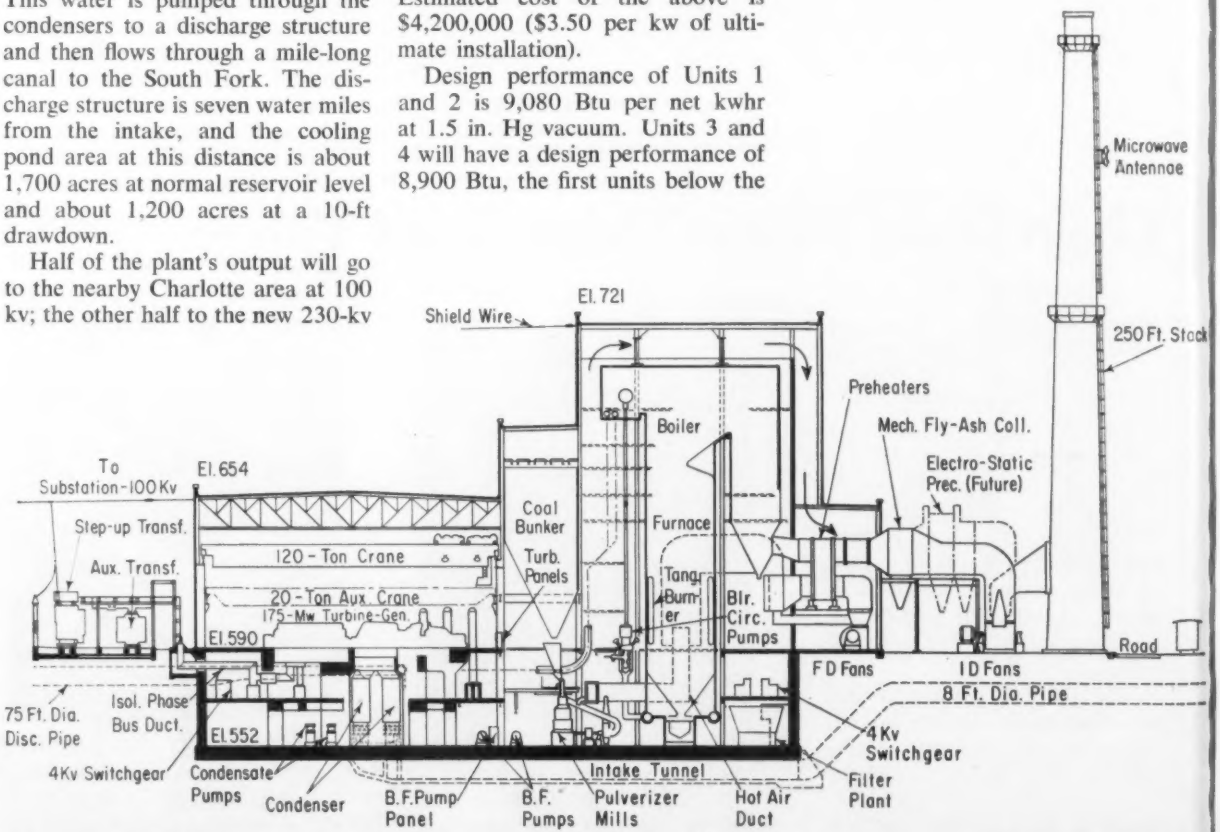


FIG 1—UNIT-TYPE PLANT has one boiler, one turbine, one transformer per unit. Turbine, boiler, FD fans are fully enclosed. Outdoors are ID fans, condensers circulating pumps, fly-ash precipitators, main auxiliary transformers

With 1,200-Mw Capacity in 1961

rectifiers. The latter have been justified through savings in power consumption and tube replacements.

Units 1 and 2 are 3,600-rpm units with a nameplate rating of 165,000 kw and a continuous capability of 175,000 kw. The turbines are tandem compound reheat type, triple flow, 23-in. blade exhausts and operate on steam conditions of 2,400 psig, 1,050F and 1,000F reheat. Six-stage bleeding to heaters bring feedwater to about 470F.

Units 3 and 4 will be Duke's first cross-compound turbines, each with a nameplate rating of 275 Mw and a peaking capability of 290 Mw. Each high-pressure turbine will operate at 3,600 rpm, generating about 53% of the total output. The low-pressure unit will operate at 1,800 rpm, generating the other 47%. Steam conditions will be the same as for the earlier units, and there will be seven stages of feedwater heating.

Condensers are the horizontal, two-pass, divided water box type, with a deaerating section and normal hotwell storage of 15-min capacity at full rating. Condenser design is based on a vacuum of 1.4 in. at a cooling water temperature of 66F.

Needs 2,700 Tons Daily

The coal handling system was designed on the basis of a single shift operation for the ultimate capacity, although continuous reclaiming will take two shifts. Daily coal requirements are 2,700 tons a day for the initial and 9,300 tons (160 cars) for the ultimate plant.

Incoming coal is weighed by an electronic scale on the car dumper. On each of the two conveyors from the transfer house to the plant, a belt scale of the electronic load-cell type will weigh coal delivered to the plant bunkers, and a magnetic separator will remove tramp iron. Continuous coal sampling equipment will take samples from each of the two conveyor belts entering the plant.

Fly ash is removed pneumatically from hoppers and sluiced along with boiler bottom ash to a 65-acre ash storage basin. A dry ash storage silo with loading equipment will be installed with Unit 4. The company hopes to increase the sale of fly ash collected for use in concrete and other commercial purposes. Fly ash is replacing 25% of the cement in structures for Units 3 and 4.

Each unit will have two half-size boiler feed pumps. Those with Units 1 and 2 are driven by a 3,000-hp, 3,600-rpm induction motor through a hydraulic coupling for speed control. Boiler feed pumps with Units 3 and 4 will be driven by 4,500-hp motors. On major auxiliaries, installed spares have been reduced to a minimum where the designers con-

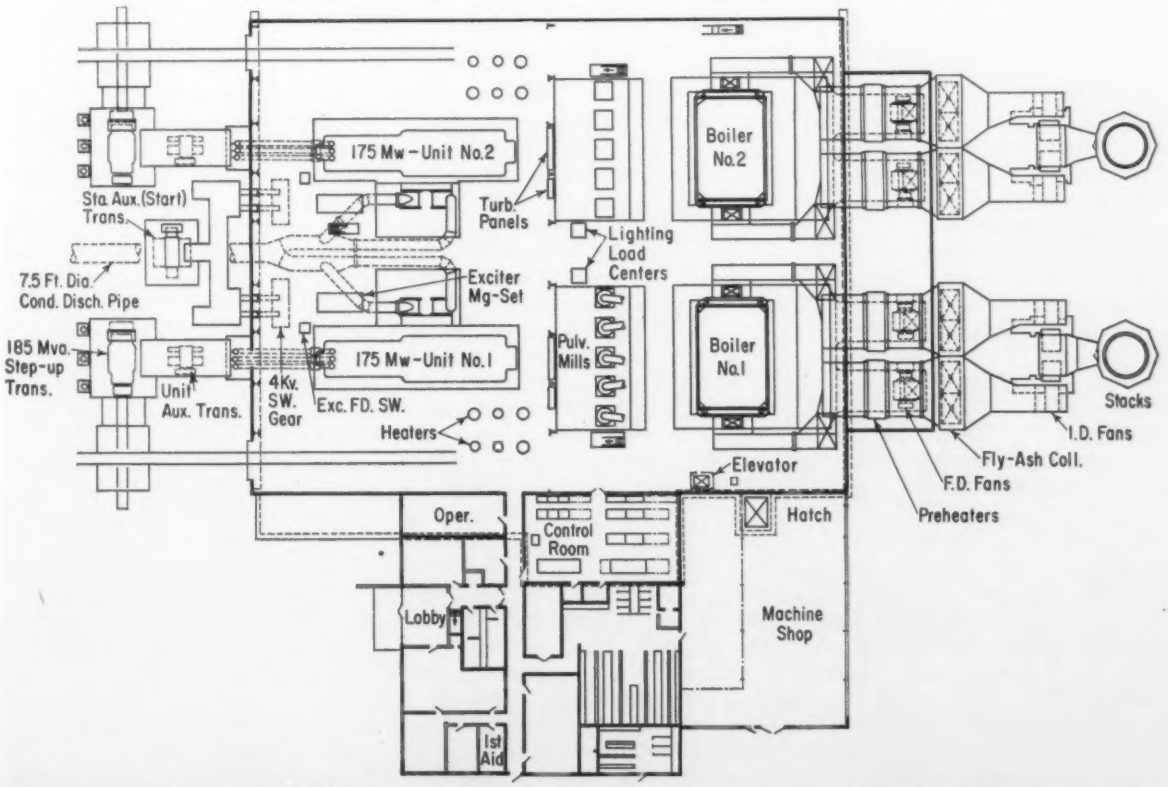


FIG 2—PLAN OF OPERATING FLOOR shows the general arrangement of turbine-generators, boilers, transformers, the service building, and Control Room No. 1. The boilers are of the forced or controlled circulation type

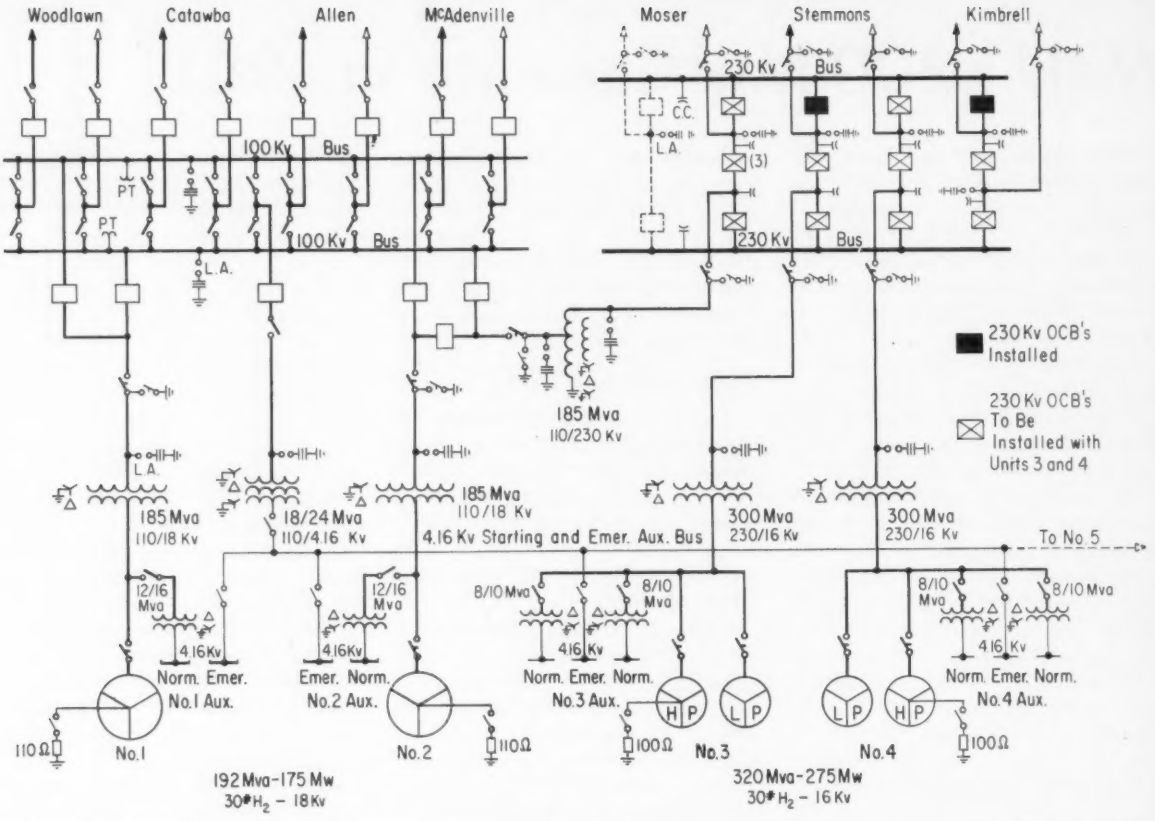


FIG 3—ONE-LINE DIAGRAM shows basic electrical system for Duke Power's Allen Plant. The space occupied by electrical equipment other than control room area was space inherent in layout of items such as the boiler and turbines

sider the reliability of equipment permits the elimination. Thus spare boiler feed pumps have been eliminated at considerable savings and to simplify design.

All generators will operate under load-frequency control via microwave from the load dispatcher's office in Charlotte.

A spare 400-kw exciter will be installed with Unit 3 and will serve as spare for any exciter of the five units in the ultimate plant. Transfer to the spare exciter will be by "dead" transfer. Auxiliary power for cooling on the generator step-up transformer will be normally supplied from a self-contained auxiliary transformer connected to the low-tension winding of the main transformer by means of fused disconnects to bushings in the tank wall. This arrangement the designers considered superior to the usual scheme of locating the auxiliary transformer in the tank with the main transformer winding. The likelihood of auxiliary transformer failure causing outage of the main transformer is eliminated, and the scheme permits ready maintenance or replacement without outage of the main transformer.

Protection Described

The generator differential is obtained with "through" type current transformers mounted in the generator frame, through which pass the main and neutral leads prior to connection to the generator terminals. Secondaries are connected to instantaneous overcurrent relays. No separate transformer differential is used. An overall differential from generator neutral and high side of the auxiliary transformer to the 100-kv generator oil circuit breakers protects the transformer OCB's and 100-kv span between the transformer and OCB's.

A substation bus differential overlaps the generator OCB's, and separate differential protection is provided on the auxiliary transformer.

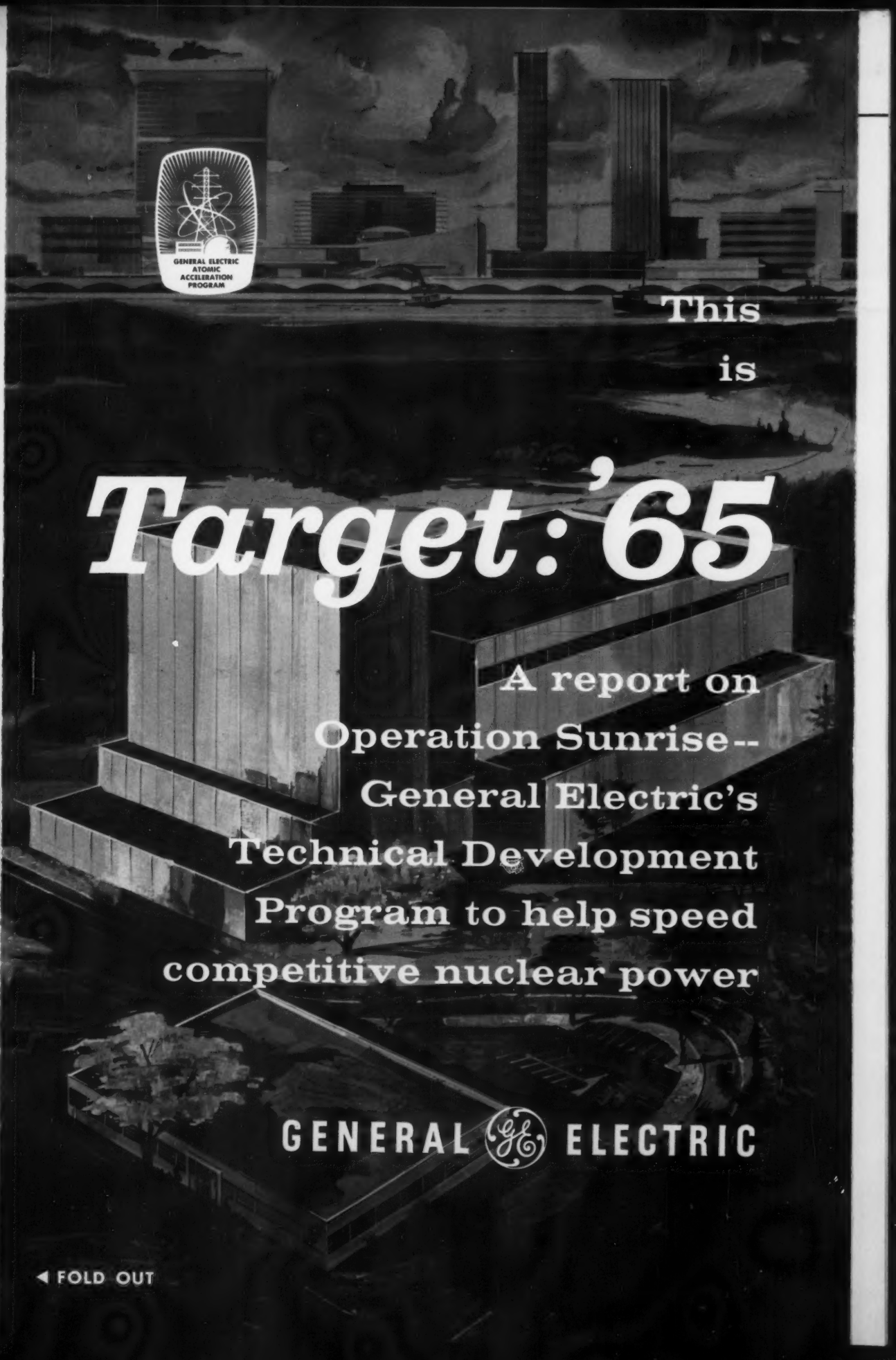
A generator neutral ground relay gives additional back-up protection for the generator and the transformer low-voltage winding. Similar back-up for the 100-kv side of the transformer and span to the substation is provided by a transformer neutral ground relay.

Overcurrent relays with voltage restraint furnish additional back-up protection for the generator. A negative sequence current relay trips the unit to prevent rotor overheating, and a loss-of-field relay completes the generator protective scheme.

The relaying for Units 3 and 4 will be similar. But, because of the size of the generators and ultimate capacity of the 230-kv system, back-up protection for breaker failure will be added. On failure of the generator tie OCB, the remote line terminal will be opened by carrier transfer tripping. Instantaneous solenoid over-current relays connected to the OCB bushing CT's will detect failure of the OCB.

Normal supply for station auxiliaries of Units 1 and 2 is from a 12,000/16,000-kva, 18/4.16-kv, OA/FA transformer connected to

(*Continued on page* 96)


GENERAL ELECTRIC
ATOMIC
ACCELERATION
PROGRAM
This
is
Target:'65
A report on
Operation Sunrise--
General Electric's
Technical Development
Program to help speed
competitive nuclear power
GENERAL ELECTRIC
◀ FOLD OUT

GENERAL ELECTRIC

TECHNICAL DEVELOPMENT

PROGRAM FOR

Competitive Nuclear Power by 1965

The goal of the Technical Development Program is to develop the technology to design competitive nuclear plants by 1965. Each successive reactor design in the program, shown in chart at the right, incorporates the best features of previous designs—plus innovations resulting from research and development work in specific areas of technology.

Four progressive phases lead to nuclear-electric power that will be considered conventional:

FIRST GENERATION PHASE—These plants, already operating or being constructed, form the solid technological base for concentrated development of the boiling water reactor.

DEVELOPMENTAL PHASE—The construction of four of the developmental reactors (those shown in the left-hand column of the Developmental Phase) is required to provide the technological advances necessary over the first-generation plants. Operating date is 1961–62.

The design progress of these first four developmental reactors will determine if any of the alternate reactors (right-hand column) is required. The operating date of these alternate reactors would be 1963–64; capital cost range—$275–325/kw; fuel cost range—2.7–3.3 mills/kwh.

EVOLUTIONARY PHASE—Competitive in high-fuel-cost areas in the United States, these plants will utilize technological advances made in the Developmental Phase. They cover ratings from 50 mw to 300 mw and will be operating in 1965–67; with capital cost range—$225–275/kw; fuel cost range—2.3–2.7 mills/kwh.

TARGET PHASE—These plants, covering ratings up to 450 mw, will be competitive with 25% of the 1970 conventional additions. The operating date is 1969–71; capital cost range—$175–225/kw; fuel cost range—1.8–2.2 mills/kwh.

Progress Is Our Most Important Product

GENERAL ELECTRIC

FIRST GENERATION PHASE

1. Predictability of Stability
2. Transient Response Analysis
3. Ease of Start-up and Control
4. Radiation Levels in System
5. Safety Characteristics

6. Natural Circulation Performance
7. Free Surface Steam Separation
8. Oxide Fuel Development
9. Radioactive Transport
10. Long Burnup Physics
11. Superheat Demonstration
12. Dual Cycle Demonstration
13. Water Chemistry
14. Corrosion Rates
15. Dry Cask Refueling

1. Oxide Fuel Statistics
2. Nuclear Stability
3. System Component Tests
4. Long Burnup Physics
5. Power Distribution
6. Plant Operating and Availability Data

NOTE

The major technologies gained from each developmental project are listed under each diagram. The connecting lines between diagrams show the primary chains of technological development. Each successive reactor will contribute technology to every plant yet to be built, resulting in a blending of technologies.

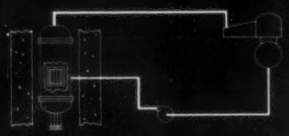
The chart shows the *maximum* number of developmental projects and generating plants which *may* be required for the complete program.

Reactors in the Developmental Phase should be classified as experiments; whether they actually generate power will be determined by the customer, as the developmental program relates to the reactor only. *It is important to note that competitive power is reached at the completion of the Developmental Phase.*

DEVELOPMENTAL PHASE

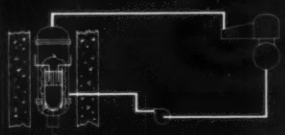
TARGET '65—NUCLEAR POWER BECOMES

NATURAL CIRCULATION BOILER—2



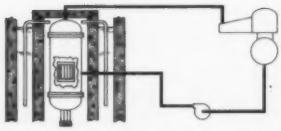
1. Natural Circulation with High Quality Steam
2. Upper Limit of Free Surface Steam Separation
3. Low Pressure Drop Core

COMPACT—1



1. Internal Mechanical Steam Separation
2. Internal Recirculating Pump
3. Side Entry Control

COMPACT—2

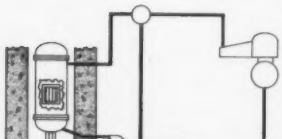


1. Increased Power Density
2. Pool Containment
3. Long Life Fuel
4. High Performance Steam Separators
5. Scale-up of Control System, Pump

HIGH POWER DENSITY—1

1. High Power Density Fuel
2. High Power Density Core
3. Increased Pressure
4. Longer Burnup Fuel

HIGH POWER DENSITY—2



1. Close Coupled Pump
2. Nuclear Stability Limits
3. Close Packed Lattice
4. High Power Density Core
5. Advanced Control System
6. High Pressure Saturated Turbine
7. Straight Through Fuel Design

INTERNAL SUPERHEATER—1

SEPARATE SUPERHEATER—1

1. High Temperature Materials
2. Radioactive Carryover
3. Shutdown Cooling
4. Transient Load Matching Between Boiler & Superheater
5. Mechanical Components Proved
6. Optimized Lattice Design

INTERNAL SUPERHEATER—2

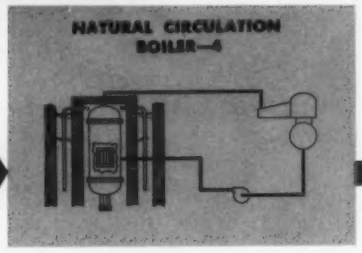
SEPARATE SUPERHEATER—2

1. Improved High Temperature Fuel
2. Optimization of Superheat Conditions
3. Scale-up of Design Features
4. Scale-up of Control Systems

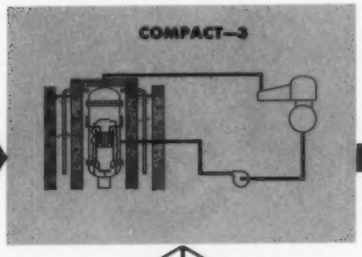
EVOLUTIONARY PHASE

TARGET PHASE

R BECOMES COMPETITIVE



1. Single Vessel Output Limit
2. Limits of Hydraulic & Nuclear Stability
3. Fixed Control System
4. Low Pressure Drop Steam Separator
5. Pool Containment
6. Simplified Core Design



1. High Pressure Saturated Turbine
2. Operation With Higher Quality Steam
3. Scale-up of Internal Pump

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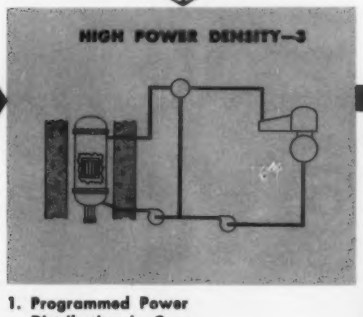
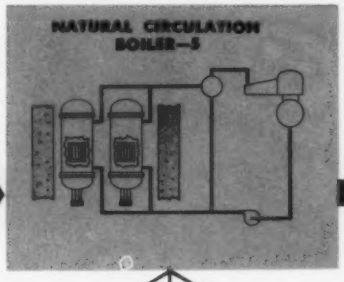
4. Controlled Power Distribution
5. More Efficient Steam Separators



1. Programmed Power Distribution in Core
2. Two-loop Close Coupling
3. Low Pressure Containment
4. Axial Fuel Rearrangement
5. Uniform Matrix Core



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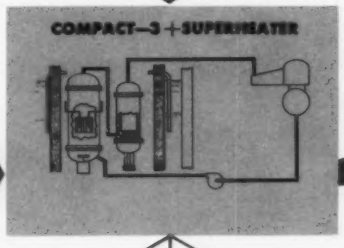

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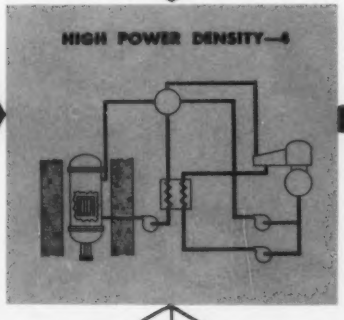

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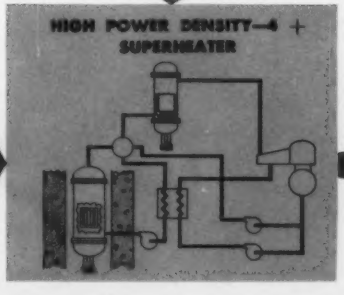


CONVENTIONAL NUCLEAR PLANTS

**The present state of development indicates that these two plants might logically be combined into one plant with the best features of both. Progress in the Developmental Phase will indicate more clearly if this can be done.*

***These are the most likely results of the program. Ideally, the best features of each of these would be combined into one type of plant at this stage. Progress in the evolutionary stage will indicate the best combination.*

5 Technological Objectives of the General Electric Technical Development Program

General Electric has carried out extensive analyses to determine a clear course to economical atomic-electric power plants. This effort involved design studies of various promising reactor systems; analyses of other reactor programs; analyses of development still required for advancing various designs; and evaluation of the performance and economics of each system.

These analyses of all promising reactor systems indicate that the boiling water reactor has the best potential for attaining competitive nuclear power first and at least cost. The boiling water reactor warrants concentrated development in depth because it now has a solid technological base, has the most promising cost potential, and has a clearly predictable path of development.

SPECIFIC, REALISTIC TECHNOLOGICAL OBJECTIVES

With this solid base, General Electric is now ready to work on the specific technological objectives that will lead to economical atomic-electric power operation:

1. **Increased power density**—to double the power output from the present 30 kw per liter of reactor core volume to 60 kw per liter.

2. **Simplified and compact plant design**—to simplify the steam supply system, make plant layout more compact, reduce containment costs, and increase plant reliability.

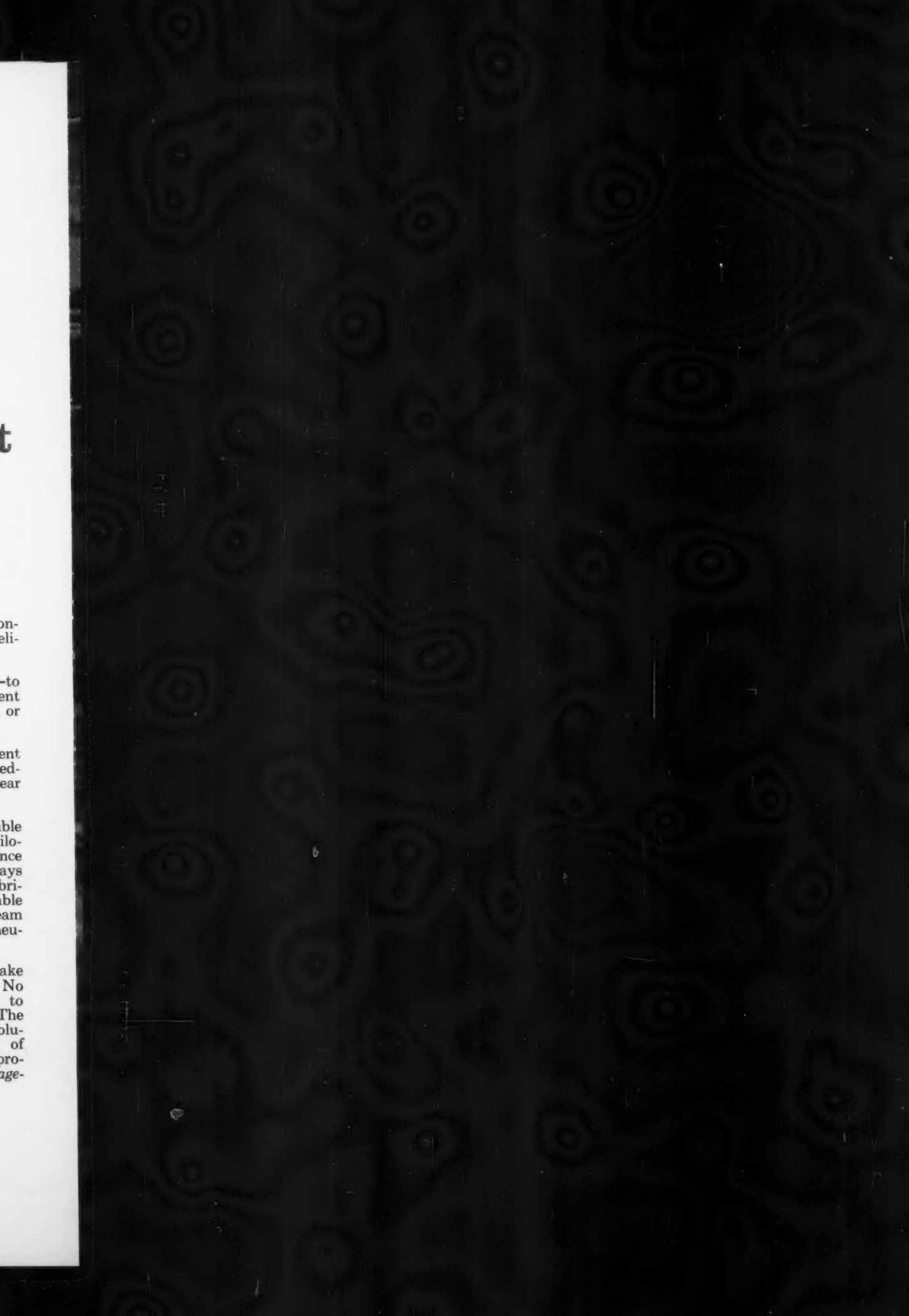
3. **Improvement in steam conditions**—to increase thermal efficiency from the present 28% to over 32% with saturated steam, or 35% to 37% with nuclear superheating.

4. **Increased plant size**—to raise the present practical size from 200 mw for a saturated-steam plant to over 450 mw for a nuclear superheated-steam plant.

5. **Improved fuel performance**—to double specific power from 10 to 20 kw per kilogram; to develop reliable fuel performance for exposure up to 15,000 megawatt-days per ton; to decrease present-day fuel fabrication cost by 50%; to increase allowable operating temperatures up to 1000°F steam outlet temperatures; and to improve neutron economy.

Attainment of these objectives will make economical nuclear power possible. No scientific breakthroughs are required to realize the desired economical results. The effort needed is evolutionary, not revolutionary—it is an orderly marshalling of existing resources and experience, progressing to economical power with *manageable* technical and financial risk.

GENERAL ELECTRIC



How General Electric can help utilities with their nuclear power acceleration programs

To maintain international prestige and security, the United States must lead the world in making available widespread use of economical nuclear-electric power. Our government has foreseen the international importance of nuclear power acceleration, and the compelling forces lead to one conclusion: atomic acceleration in the United States is a fact.

To help achieve the acceleration goal, General Electric's Technical Development Program was designed as an industry plan that complements the government's acceleration objectives. It is based on the convictions of solid experience—resulting in a clearly defined technical plan for concentrated development in depth of the boiling water reactor.

To achieve economical nuclear power at least cost as soon as possible, the reactor that is *now* best established must be used. The boiling water reactor meets the conditions because:

The BWR has a solid technological base gained through experimental data, design and construction experience from six first-generation plants, and a number now in the design and construction stages.

The BWR has the lowest capital cost of any proven reactor, primarily due to the extreme simplicity of the system.

The BWR has a predictable path of development with realistic technological objectives—shown in the Technical Development Program.

General Electric will continue to actively investigate various reactor types while implementing this major effort in developing the boiling water reactor.

The key to the program is the Developmental Phase. Immediate action is needed for the following developmental projects to help industry meet its goal of economical nuclear-electric power:

NCB-2 **NATURAL-CIRCULATION BOILER REACTOR**—This reactor will stress extreme simplification of the system with lowered costs. It has been committed and is being designed for the Pacific Gas & Electric Company.

C-1 **COMPACT REACTOR**—This reactor is required to develop optimum design and construction simplicity for forced-circulation plants.

HPD-1 **HIGH POWER DENSITY REACTOR**—This reactor is required to test the limits of power density and provide full-scale proving of high-power-density fuel.

SSH-1 or ISH-1 **SEPARATE SUPERHEATER OR INTERNAL SUPERHEATER**—This plant will be used to evaluate operating and maintenance characteristics, as well as determine the feasibility of nuclear superheat.

General Electric will be happy to provide details on this program and meet with you and your technical people to discuss any aspect—contact your nearest General Electric Apparatus Sales Office or write to the Atomic Power Equipment Department, General Electric Company, 2151 South First Street, San Jose, California.

For a more detailed discussion of the Technical Development Program, write for GED-3750, How to Implement Nuclear Power Acceleration, General Electric Company, 1 River Road, Schenectady, N. Y.

192-12

Progress Is Our Most Important Product

GENERAL ELECTRIC

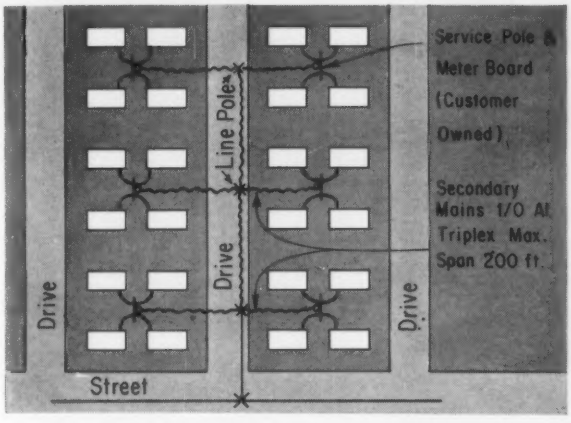


Fig 1–Roadside Distribution

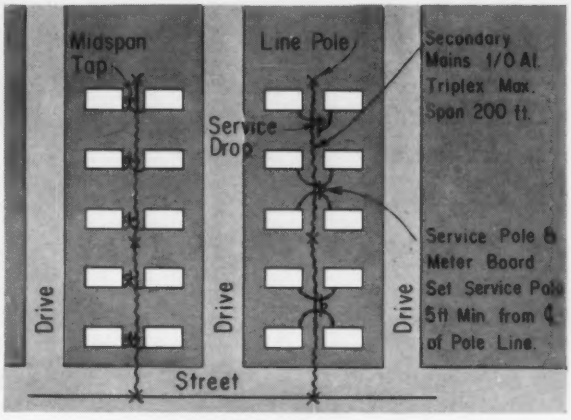


Fig 2–Back Lot Distribution

Plan Distribution for Trailer Park

An adaptation of distribution standards of Central Maine Power Co

In permanent year-round trailer parks, company will provide all normal overhead distribution. Owner is required to provide means for attachment of service drops and for mounting of meters and customer service equipment.

Location of pole lines within the trailer park will vary according to the trailer arrangement. The method used should be determined in the field by local personnel with due regard given to the economics of construction. Figs 1 and 2 show roadside pole line and back lot distribution.

Service pole shown in Fig 3 should be considered as the minimum requirement. All such customer-owned poles should be of sufficient height to allow necessary clearance from ground as specified in the National Electric Safety Code. Guying requirements should be specified, according to need, by local personnel.

Service cable from meters to the service head should be a minimum of No. 6 copper for one trailer. For two to four trailers, use a minimum of No. 3 copper. Equivalent wire in steel conduit may be used in place of service cable.

Meter board should be of sturdy construction, securely mounted, and sealed with paint or preservative. A maximum of four meters is to be mounted on one pole.

Grounding conductor should be a minimum of No. 8 copper, installed and protected according to National Electric Code wiring standards.

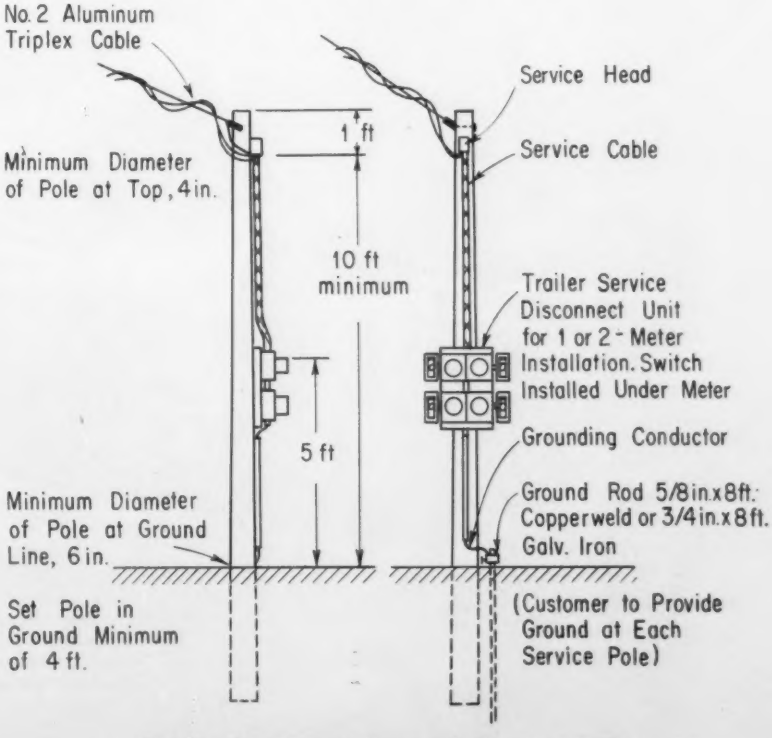
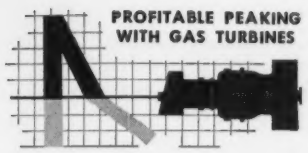

No. 2 Aluminum Triplex Cable
Service Head
Service Cable
1 ft
Minimum Diameter of Pole at Top, 4 in.
10 ft minimum
Trailer Service Disconnect Unit for 1 or 2 - Meter Installation. Switch Installed Under Meter
5 ft
Grounding Conductor
Ground Rod 5/8 in. x 8 ft. Copperweld or 3/4 in. x 8 ft. Galv. Iron
Minimum Diameter of Pole at Ground Line, 6 in.
Set Pole in Ground Minimum of 4 ft.
(Customer to Provide Ground at Each Service Pole)

Fig 3–Customer-Owned Service Pole

(left to right) Messrs. C. W. Elston, General Manager—Gas Turbine Department, G. B. Warren, Vice President and Consulting Engineer—Turbine Division, and W. S. Ginn, Vice President and General Manager—Turbine Division discuss advantages of a gas turbine peaking unit.



A decade of expanding peaking requirements for electric utilities

Gas turbines—economical answer to varied peaking applications

Rapid peak load growth coupled with reduced steam cycle efficiency gains made in recent years have focused new attention on the costs incurred for providing added peak load capacity.

Today many electric utility systems are relatively saturated with steam turbines nearly as efficient as the latest units. This basic change in the economics of peak load generation dictates a renewed interest in low-investment gas turbines for a wide variety of peaking applications.

Let's examine briefly some of the basic advantages inherent to gas turbine peaking.

GREATER CAPACITY IN ONE UNIT. In sharp contrast to small building-block units, General Electric offers a peaking gas turbine designed to produce 20,000–25,000 kilowatts. Even larger units are planned to keep pace with system load growth. Because one machine can produce over 10 times more kilowatts than a building-block unit, space, installation and maintenance costs and control complexity are appreciably reduced.

LOWER INSTALLED COST—Because of their low cost per kilowatt of capacity, low space requirements, minimum foundations and extreme simplicity, simple-cycle gas turbines are available to play an increasing role in utility peaking plans.

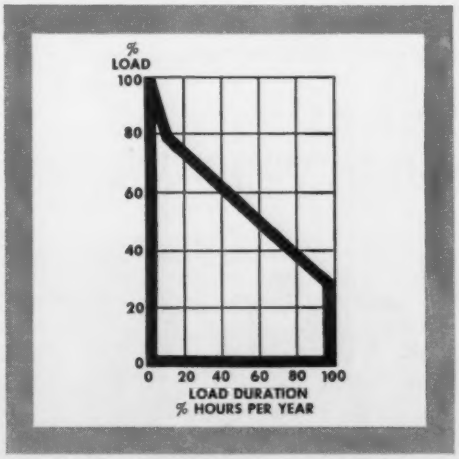
LOWER OPERATING LABOR COST—Due to their extreme simplicity, compact arrangement, and easy-to-use controls and auxiliaries, General Electric gas turbines require a minimum of operating labor. When installed at existing steam power plants, additional operating labor is usually not required. Opportunities of remote operation provide still another means of substantially reducing this type of peak load generating expense.

LOWER STANDBY COST—In sharp contrast to steam plants which must be kept hot during off-the-line periods, gas turbines require no attendance or auxiliary service during periods of inoperation. Since standby fuel costs are eliminated, the total fuel consumption for equivalent peak generation is often less with gas turbines.

LOWER MAINTENANCE COSTS—With maintenance charges for older steam units increasing steadily . . . and with the prospect that maintenance costs will increase still further with the eventual assignment of modern reheat steam units to peaking service, low gas turbine maintenance costs are of growing importance to many utilities. For short duration peak load service, gas turbine maintenance costs will be considerably less than with older steam plants often used for this service.

Gas turbines are ready—now—to fill your growing peaking requirements. With 189 units now in service logging a total of nearly 3,000,000 operating hours, General Electric gas turbines stand ready to assume their rightful role in helping meet tomorrow's growing peaking power demands—economically.

FOR MORE INFORMATION contact your nearest G-E Apparatus Sales Office or write Section 261-33A, General Electric, Schenectady 5, New York.



WITH THE TOP TEN PER CENT of system load having a duration of only a few hundred hours annually, gas turbines offering lower initial investment costs are General Electric's answer to peaking power requirements of the future.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Westinghouse Unveils New Transformer Plant

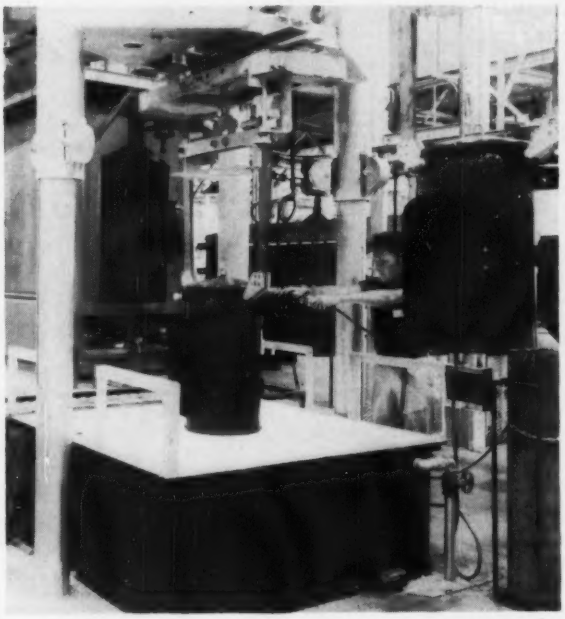
Final test in mechanized production of distribution transformers at the new Westinghouse Athens (Ga.) plant is complete immersion for a preset time in water. The conveyor system includes a lowering device for this test. Leakage is revealed by bubbles of nitrogen applied through a flexible connection to a pressure sufficient to test the cover assembly used to support the unit. Objective is to provide tightness sufficient to prevent "breathing" during cyclic loading which might inhale moisture-laden air to deteriorate oil and insulation, according to W. A. Zarbis, supervisor of manufacturing engineering.

Nine standard electrical tests are applied automatically in 90 seconds at a 14-position rotary test station preceding the immersion. Results are evaluated and punched out on record cards which automatically reject sub-standard transformers.

Automation has been applied to almost every step of this new facility designed to turn out a complete unit every two minutes. Conveyors of many kinds progress the parts through required processes from the unloading decks to the shipping area.

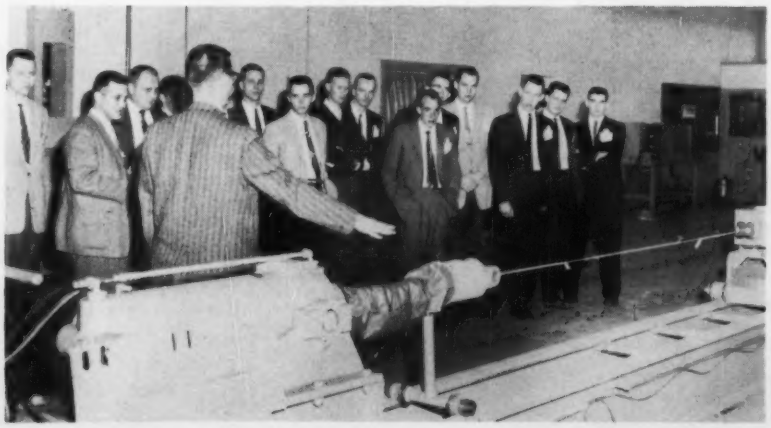
Facilities include one line which converts steel sheet to finished and painted tanks, another which forms electrical sheet into completed cores ready for assembly, and a third which draws wire from rod, enamels it, and winds it into self-supporting coil assemblies. Finished tanks, coils, and cores are then conveyed in proper sequence into a humidity controlled room for final assembly.

Key to this automation is the strip-wound core, automatically measured and welded, then slit into single-turn laminations which are pressed into final rectangular form and annealed to relieve stress and prevent spring back. Two such cores are shipped into the self-supporting, progressive-wound coil assembly and reclosed into very low-loss magnetic loops. Impedance level of such assemblies is under 2%. And space and weight advantages of the new core and coils have been a major factor in extending the pole-mounted transformer range from the 167-kva originally planned for the Athens plant to the 2,100-lb 333-kva unit recently announced.



TOTAL IMMERSION in water tank is final test of new distribution transformers at modern Athens, Ga., plant

Students Visit Preformed's Vibration Laboratory

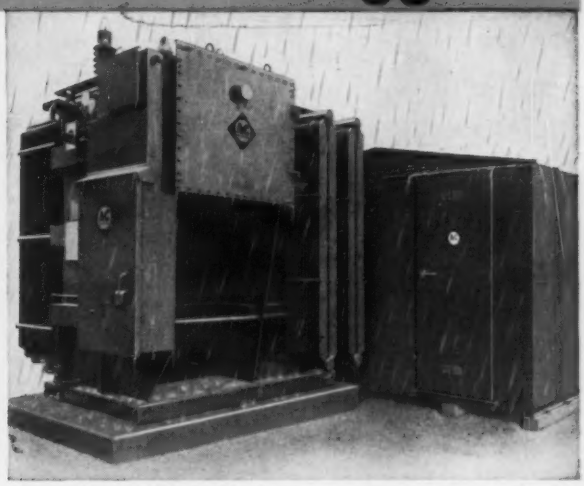


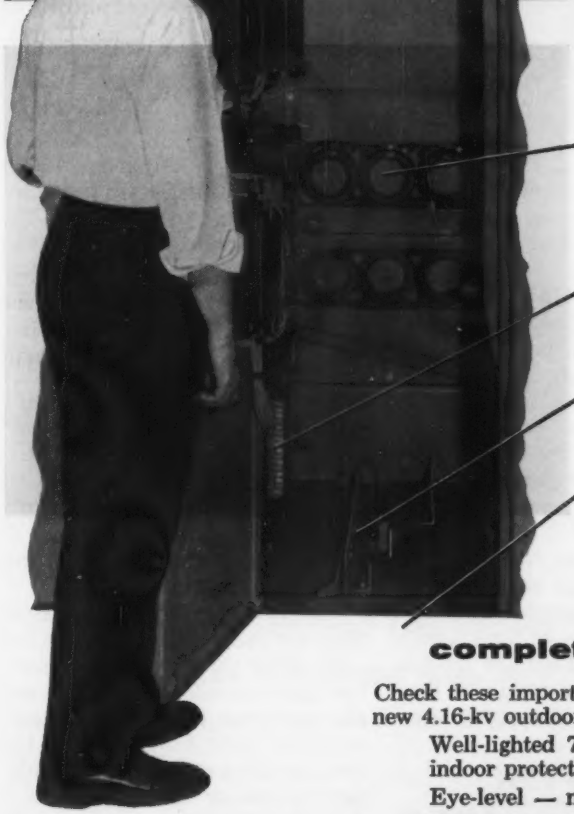
Vibration measuring instruments in action were demonstrated recently to engineering students of Case Institute on a tour of Preformed Line Products Co's Research & Engineering Center. Students heard lectures by J. C. Poffenberger, assistant director of research and engineering; S. Grosshandler, senior engineer; R. A. Eucker, project engineer.

The $1.5-million Preformed R&E Center is devoted to study of vibration and other destructive forces affecting overhead conductors.

(*More Manufacturers News, p* 70)

ALLIS-CHALMERS modern line for '59





- Aisleway accessibility — current transformers in front of positive-acting shutters.
- Automatic connecting, self-aligning secondary disconnects — no plug jumpers.
- Interlock-guide track self-aligns breaker.
- Flush mounting with floor eases breaker insertion.

NEW Shelter-Clad . . .

completely accessible switchgear

Check these important "accessibility" features of Allis-Chalmers new 4.16-kv outdoor switchgear:

Well-lighted 75-inch-wide service aisle for clean, roomy, indoor protection.

Eye-level — no stretch — instrumentation.

Room above breaker to house potential transformers or control power transformer fuses.

Relay, rectifier, and capacitor elements are mounted on breaker for easy access when breaker is in aisleway.

Standard secondary terminal blocks are accessible from inside aisleway.

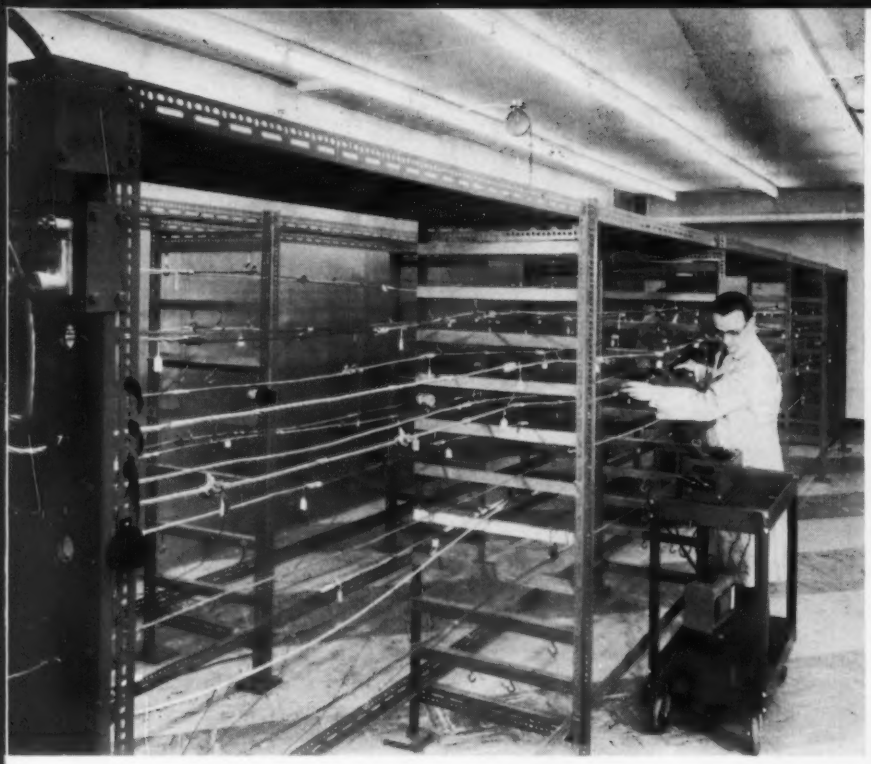
In addition to these "accessibility" features, you get *Pyro-Shield* track-resistant insulation plus unique personnel safety features.

Get all the details from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pyro-Shield and Shelter-Clad are Allis-Chalmers trademarks.

A-5918

ALLIS-CHALMERS



Precision Lab Proves Connector Designs

Jasper Blackburn completes current-cycling lab for accelerated connector tests

Close to an ideal environment for making accelerated tests on distribution connectors has been built into a unique new precision test chamber at Jasper Blackburn Corp's recently completed current cycling laboratory at St. Louis.

Here in a test room where the air conditioning is virtually draftless and the room temperature doesn't vary 3 C in summer under the worst test conditions, Blackburn engineers evaluate new connector design ideas and conduct connector tests for utility distribution system designers.

These stable test conditions are maintained in the new laboratory in spite of current concentrations in test lines of splice connections that often yield conductor temperatures of 125 C and generate substantial amounts of heat.

"Without a specially designed test room," Blackburn's Chief Engineer John A. Toedtman points out, "the effects of design modifications are often completely masked by experimental inaccuracies."

Variations of 15 to 30 C in conductor temperature can occur even with a fixed current flowing through a given conductor, he explained. Such variations may be caused by ambient temperature variations during the day and by local drafts. Moreover, experiments have shown that a variation of 25 C in conductor temperature, at test levels, may affect the life of many types of connectors as much as 100%, he said.

In designing the new laboratory Blackburn engineers have used a novel porous wall construction to achieve a relatively uniform low-velocity air flow. Conditioned air supply bleeds out of one lengthwise wall, drifts across the room, and is drawn into the opposite wall. Porous walls are made of perforated aluminum sheets set 2 ft out from the masonry walls of the room to create plenums big enough to prevent the creation of air pressure differentials. Oversize ducts, to prevent erratic air flow, run the length of the test chamber above the plenums. Outlets to the plenums are at 2-ft intervals.

Lab Has Four Test Racks

Air flow is constant at 7,000 cfm regardless of refrigeration or heating load and is conditioned by equipment with a cooling capacity of 9 tons at 105 F outdoor temperature. Infinitely modulating dampers are used to obtain any desired proportion of conditioned and by-pass air so that changes in input air temperature will be gradual.

Test connection lines are supported in four racks: two splice-type connection racks 6 ft high and 30 ft long, and two tension-type connector racks 4 ft high and 16 ft long. The racks are energized by 12 individual single-phase ac circuits ranging from 225 to 700-amp capacity. Each circuit has its own adjustable amperage control and is separately metered.

Current is interrupted at regular intervals by a time switch usually set to give equal "on" and "off" periods. "On" and "off" time intervals are selected of sufficient duration to establish temperature equilibrium in each period. Durations of 100 to 1,000 cycles are sufficient for most current cycling tests.

Air velocity in the new laboratory does not exceed 0.5 fps at any test rack. What variations exist between the minimum velocity of 0.2 fps and the maximum of 0.5 fps decrease uniformly with height. Since test lines are horizontal this means variation in velocity in any test line is less than 0.1 fps throughout its length.

Maximum variation in ambient temperature has been 1.5 C, measured when test chamber was operating at 65% of test connection capacity. Higher capacity summer operations may increase this to 3 C under the most unfavorable conditions.

(*More Manufacturers News, p* 72)

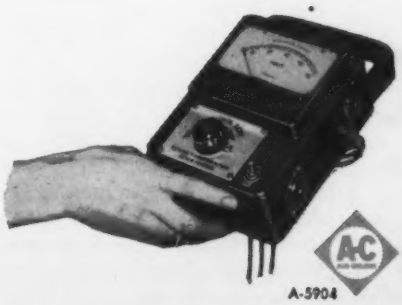
ALLIS-CHALMERS modern line for '59

Caliband control provides accurate settings quickly . . . eliminates customer complaints

Now you can set or test voltage level and band width without changing customer voltage or interrupting regulated service. A twist of the *Caliband* control knob does it.

Caliband control demonstrator

Ask an A-C engineer to demonstrate *Caliband* control at your desk with an actual unit in a portable kit. Contact your nearby A-C office for a demonstration, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.



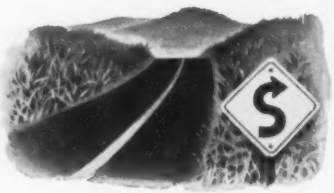
Caliband is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Originators of ⅛% step regulators

Whatever your brush problem

Line?



Roadside?

Right-of-way?

WEEDONE can solve it!

With the right background—Chemical control of weeds and brush has developed along established lines of procedures and practices. Amchem initially pioneered the major advances in the field, has originated many of today's accepted procedures and products for efficient, economical weed and brush control. Your problems are in *experienced* hands when you hand them to Amchem!

With the right approach—Amchem's corps of weed and brush specialists are basically application specialists. Combining comprehensive theoretical and practical experience they are able to offer all industry a realistic approach to *any* weed or brush problem. These specialists have developed a variety of efficient weed and brush eradication programs over thousands of miles of line, roadside and right-of-way areas once choked and inoperable due to infestation.

With the right product—Amchem's tremendously diversified product line is your assurance that the right weed and brush killer is available and will be utilized for your specific problem. Weedone Brush Killers, for example, have been used in the field for years and proven eminently successful in eliminating weeds and brush wherever they are a problem. Why not bring your problems to Amchem?

Amchem and Weedone are registered trademarks of Amchem Products, Inc.

AMCHEM PRODUCTS, INC.
AMBLER, PA.

Please send me copies of your "Brush Control" brochure and full information on the uses of Weedone Brush Killers.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

AMCHEM

WEEDONE

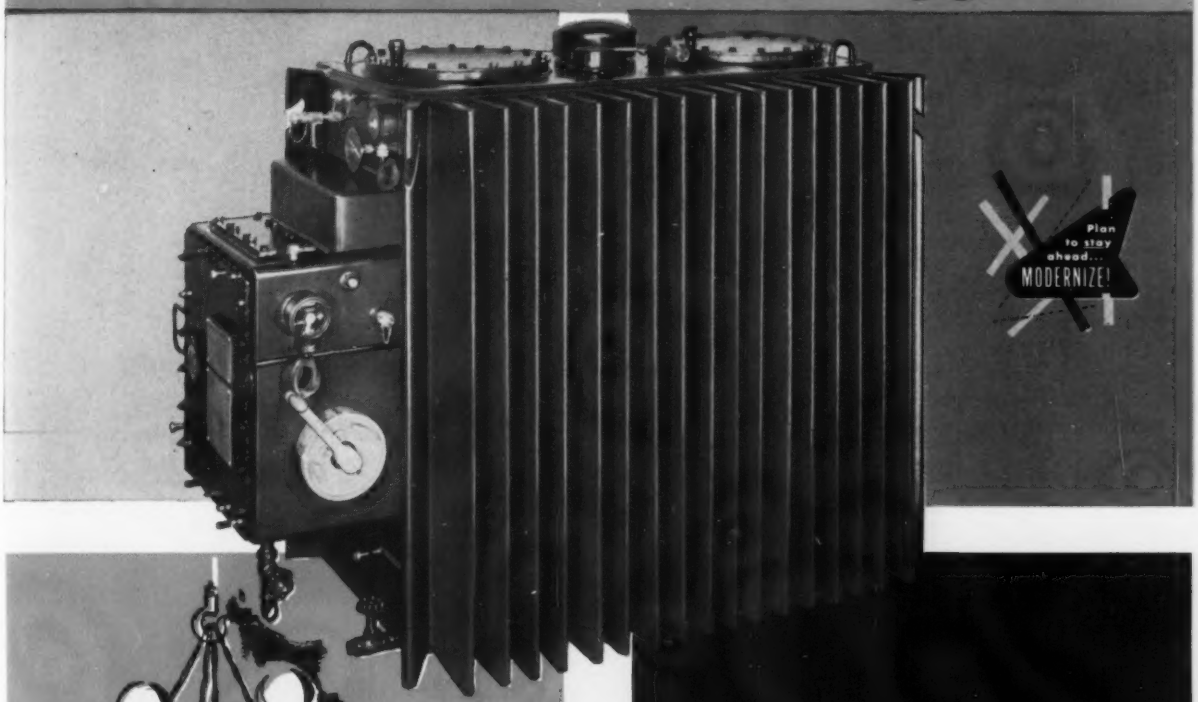
BRUSH KILLERS

another chemical development of
Amchem Products, Inc.
(Formerly American Chemical Paint Co.)
St. Joseph, Mo. • AMBLER, PA. • Niles, Calif.

MANUFACTURERS BRIEFS

Hagan Chemicals & Controls has received, through open bidding, a $1¼-million contract for control equipment for Combustion Engineering's 3,850,000-lb-steam-per-hr boiler for TVA's Widow Creek station. The Hagan package will include combustion, 3-element feedwater heater and air heater control systems, all principal metering equipment, panel boards, and automatic data processing equipment . . . **General Electric** is recommending the Atmoseal oil preservation system as standard equipment on all its power transformers, 12 Mva and above . . . **Leeds & Northrup** and **Philco** say they are "well pleased" with progress being made on their joint development of the digital control computer. It will be used with L&N instruments for process, electric, and steampower control . . . **Allis-Chalmers** has contracted to build two hydraulic turbines for Alabama Power Co installations. One will be a Francis-runner-type turbine, 111,500 hp, 210-ft head, 138.5 rpm, for Lewis Smith plant. The other will be fixed-blade, propeller runner-type, 39,100-hp, 49-ft head, 90-rpm, for Weiss Dam . . . **Southern States,** Hampton, Ga., became majority stockholder of Dominion Cutout, Ont. . . . **Bridgeport Brass** has added aluminum tubes for condensers and heat exchangers to its line. They will be made in a range of alloys, in all commercial sizes . . . **Spunco Products,** St. Louis, is granted a franchise for manufacture of centrifugally spun concrete lighting standards and transmission poles . . . **Anaconda Wire & Cable** has established a mill service center at Bound Brook, N. J. It is designed to house quantities of the company's wire and cable products previously held at several manufacturing plant locations . . . **Westinghouse** is studying a modified type of water-cooled and moderated reactor which may lead to construction of a 20-Mw atomic power plant in Spain. Recent contract calls for a 4-month study to adapt a pressure tube reactor similar to one being developed for Carolina-Virginia Nuclear Power Associates. The reactor for Spain would eliminate the large pressure vessel and substitute a group of relatively small tubes.

ALLIS-CHALMERS modern line for '59



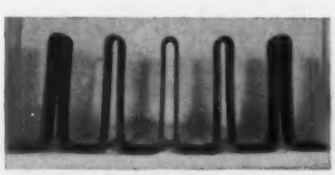
CURVACORE DESIGN shrinks network transformers

reduced size and weight cut installation costs

Smaller vault requirements per kva! That's the big economy advantage of the new Allis-Chalmers network transformer. Sizable savings in excavation and construction costs take much of the sting out of high labor rates. With a smaller, lighter transformer to handle, work crew efficiency is improved in installation. And, of course, increased kva may be installed in existing vaults where system growth requires it.

Utilities gain, too, in improved performance. Use of quality controlled *Curvacore* construction and advanced design techniques assure greater efficiency... lower exciting current and lower losses.

For detailed information on this compact transformer, call your local Allis-Chalmers representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



Corrugated tank slashes maintenance

All cooling surfaces are accessible for repainting by brush, spray or flow. Simplified preventive maintenance reduces chance of corrosion damage. Tank retains its original high strength.

Curvacore is an Allis-Chalmers trademark.

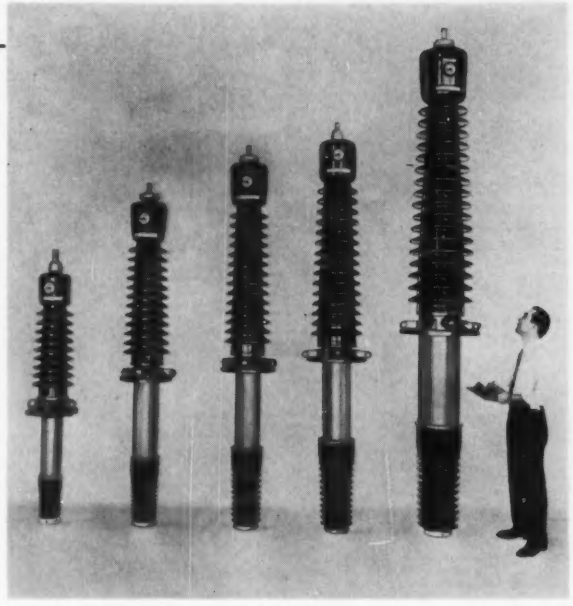
A-5939-E

ALLIS-CHALMERS

New Equipment

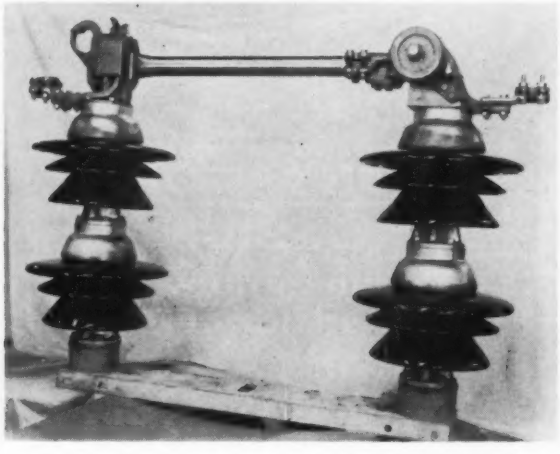
(For additional information, use Reader Service form, p 80)

High Voltage Bushings . . .



. . . are interchangeable between oil circuit breakers and transformers. Meeting both ASA and NEMA standards, the oil impregnated condenser type bushings offer high mechanical safety factors. Five basic models are available: 69 kv, 2,000 amp for OCB's; 115 kv, 1,200 amp and 1,600 amp for OCB's and transformers; 138 kv, 1,200 and 1,600 amp for OCB's and transformers; 161 kv, 1,600 amp for OCB's and transformers; and 196 kv, 1,600 amp for OCB's and transformers.

Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.



Heavy-Duty Switch . . .

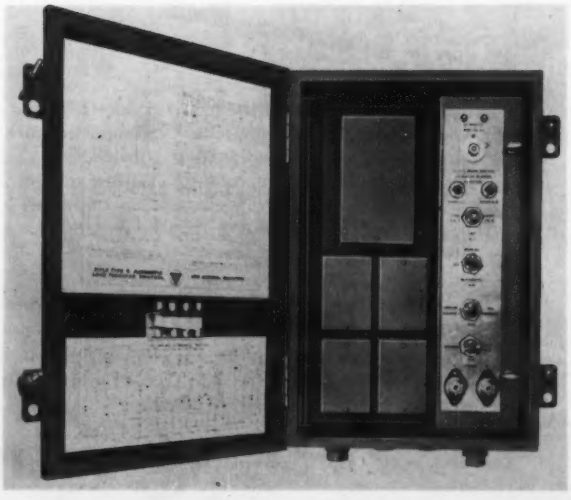
. . . is made for switching installations where gang-operated switches would be impractical because of cost. Called the HT-1H, the switch may be mounted either horizontally or vertically. It incorporates a balance spring for the blade-latching mechanism. The switch can be produced to meet most voltage and current requirements.

USCO Power Equipment Corp, 836 N 36th Way, Birmingham 4, Ala.

Load Transfer Control . . .

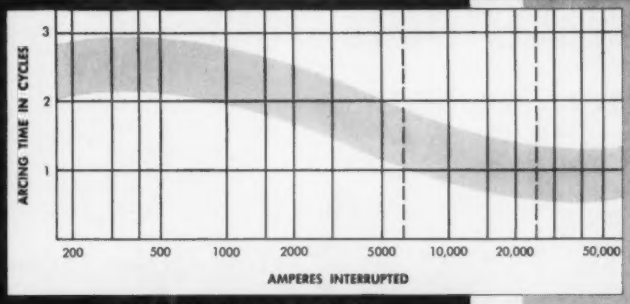
. . . senses voltage on two sources and causes associated oil switches to transfer load from one source to another if the connected source voltage fails. The Type S single-phase control is intended for use with Kyle Type NR or VR oil switches, Type R or W reclosers, circuit breakers or other switches. It operates from a 60-cps, 120-v ac source. Time delay ranges from 2 to 57 or 10 to 285 sec.

Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

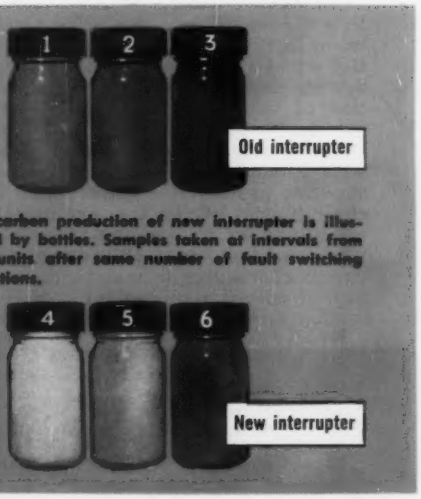


(More New Equipment on page 76)

ALLIS-CHALMERS modern line for '59



Graph shows short arcing times.



Low carbon production of new interrupter is illustrated by bottles. Samples taken at intervals from two units after same number of fault switching operations.

Ratings: 23 kv to 46 kv
500,000 kva and
1,500,000 kva

NEW interrupter cuts oil contamination

Reduced arcing time . . . less carbon . . . characterize new interrupting device for Allis-Chalmers frame-mounted breakers.

Contamination due to circuit interruption is greatly reduced . . . dielectric strength is extended.

Tests consisted of fault switching operations at current levels of 200 to 40,000 amperes.

Five-cycle operation

This new interrupting device with its matching high-speed *Pneu-Draulic* operator provides fast operation: closing, reclosing and interruption.

For complete details on Allis-Chalmers frame-type breakers, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic is an Allis-Chalmers trademark.

A-5916-E

ALLIS-CHALMERS

New, low-cost way to give old standing poles

GROUND-LINE PROTECTION

Pol-Nu treatment extends the Pole Safety Factor

Pole Safety Factor can be measured in terms of preservative in the wood in the critical ground-line area. Treated poles, as offered by the wood preserving industry, have maximum initial protection against decay and insect damage. However, there is a natural depletion of the protective chemical at the ground-line and this will eventually cause failure if preservative losses are not replaced.

A planned pole inspection program and ground-line treatment with Chapman Pol-Nu protects your line investment. Pol-Nu is a superior grease-type preservative containing a full 10% PENTA-chlorophenol. With the exclusive Pol-Nu Bandage-Maker it is easily applied to standing poles to restore the reservoir of preservative, adding up to 15 years of pole life. The modest application cost is chargeable to maintenance dollars, not the more expensive capital dollars required for pole replacement. Get complete information now, from Chapman Chemical Company.

Portable Pol-Nu Bandage-Maker produces pole bandages of exact size instantly on the job. Pol-Nu preservative feeds onto paper in a uniform, accurate coating.

Bandage is wrapped around previously cleaned pole, may be applied immediately without waiting for wood to dry. Pol-Nu penetrates wood to give lasting protection.

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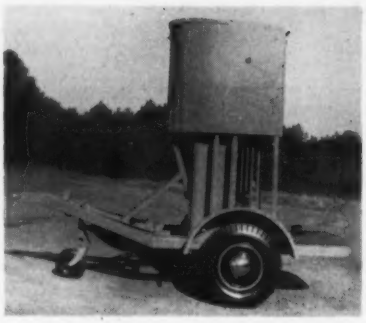

Transformer Trailer . . .

. . . in 100 to 300 kva sizes is now available. Custom-built units up to 10,000 kva may also be purchased. The trailer can be maneuvered easily by two men on reasonably level ground. Units are designed to work with most standard transformers.

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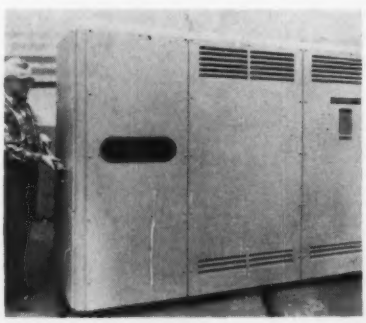


Power Centers . . .

. . . feature lower sound levels and type RM lightning arresters at no extra cost. Sound levels of the dry-type DT-3 and ASL units range from four to nearly ten db below NEMA standards. Sealed dry-type ASL power centers rated at 750 kva and above are available with external fans.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Motor Starters . . .

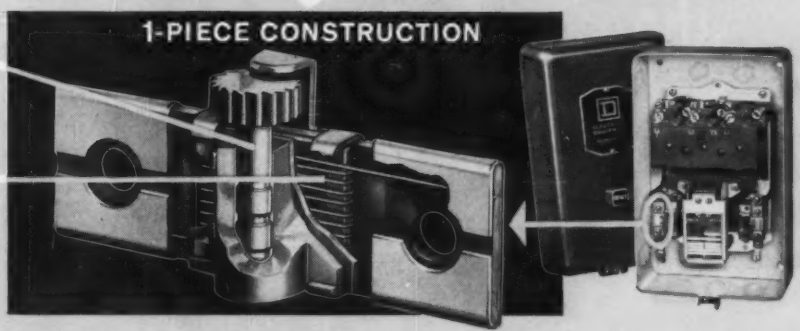
. . . line of Size 0 to 4 contactors features unitized construction, making possible the benefits of building-block modification for economical versatility. A full range of standard, special-design and accessory control

(*Continued on page* 78)

When you buy Motor Starters --

YOU PAY FOR OVERLOAD PROTECTION

...BE SURE YOU GET IT!



Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

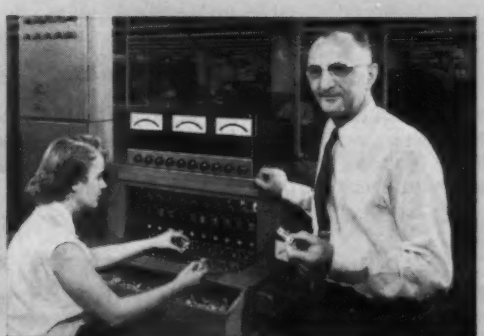
Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Only ONE-PIECE Overload Relays can give 100% Protection Only with ONE-PIECE construction can you *know* you've installed the heater correctly. Only with ONE-PIECE construction can you *know* the heater is exactly centered, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you *know* your starters will not operate without the thermal units properly installed. Only with ONE-PIECE construction can you *know* your motors have full protection.

Only Square D has ONE-PIECE Construction ONE-PIECE construction *eliminates* any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamper-proof. They are factory-assembled, are *individually* calibrated and tested. Repeated tripping will not affect their accuracy.

Insist on Square D starters with melting alloy thermal overload relays

Let your Square D Field Engineer show you 1 how one-piece construction is accomplished and how easy it is to mismatch separate heaters and solder pots— 2 an endurance tester to prove that overload units can be reset repeatedly without damage while the solder is liquid — 3 a tripping time tester to compare various types of melting alloy units and to prove that tripping time won't change after repeated operation.



Individual factory inspection of every Square D melting alloy thermal overload relay means performance you can trust. Each unit is calibrated and thoroughly tested to make sure it will perform according to its rating.

Write for Bulletin SM-275 for the complete story on Square D starters with ONE-PIECE thermal overload relays. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin

SQUARE D COMPANY

You can count on ***Amp-trap**** . . . when you want to stop a 500,000 Ampere short circuit dead in its tracks. In fact, if ***Amp-trap*** is watching and waiting at your entrance switches or in your circuit breakers — you couldn't be safer. That's why those who know *insist on and get* ***Amp-trap***.

**Protected for your protection by 27 patents.*

Amp-trap is *"always awake at the switch"* . . . where current limitation with high interrupting rating is required . . . on general power circuits, on DC circuits, on standard and the new higher voltage networks, on busways and entrance switches, even on general electronic circuits.

Amp-trap is a true current limiter because it anticipates and stops dangerous short circuits long before they can become destructive. Nothing takes the place of ***Amp-trap***. There's one for every purpose. Ask for Bulletin 514-9.

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Amp-trap® – *"Awake At The Switch"*

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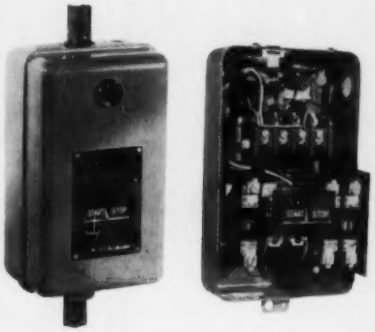
Subsidiary of I-T-E CIRCUIT BREAKER CO., Philadelphia, Pennsylvania

Motor Starters . . .

(*Continued from page* 78)



devices are available for applications from 110 to 600 v for fractional to 200 hp motors. Silver-cadmium oxide contacts minimize erosion. NEMA Type 1, 4, 5, 7, 9 and 12 enclosures are available.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

Wireholder . . .

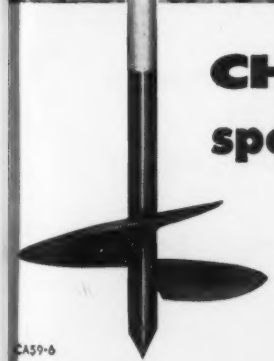
. . . with one-piece bracket mounts on pipes or service entrance masts. Designated No. 2061-C, the wireholder is die-formed from a single piece of steel. It is available in sizes to fit 2 and 2½-in. pipe.
Porcelain Products Co, Carey, Ohio.

Fusible Service Line . . .

. . . reduces inventory requirements, simplifies circuit selection, cuts installation time and is adaptable to changing needs. The new line of stab-in fusible service equipment is 100% modular. A total of 10 enclosures and five stab-in units is sufficient to handle all applications up to 200 amp. Every service installation can be tailored to individual specifications.
Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.

This line crew bores a hole for the pole, then fastens an adapter and screw anchor on the end of the bit. Screw anchor is installed without removing auger or bit.

CHANCE SCREW ANCHORS for speedy, cost-cutting machine installation



CA59-6

More and more utilities are cutting screw anchor installation time to the minimum by installing Chance Screw Anchors with their hole boring equipment. They use the Chance "Blackfoot" Screw Anchor because it is designed with fast-cutting, "pitch controlled" blades that can screw down rapidly with little earth disturbance. And, the King-size Thimbleye on these anchors easily fits the boring machine adapter. Chance Screw Anchors come in a range of sizes from 4" to 15" in diameter. You can get them from stock in most areas.

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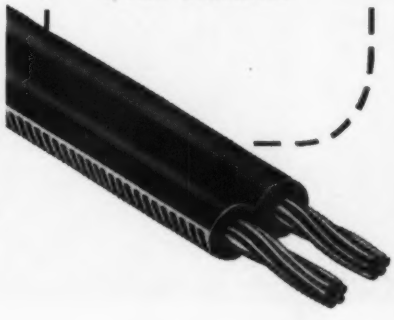

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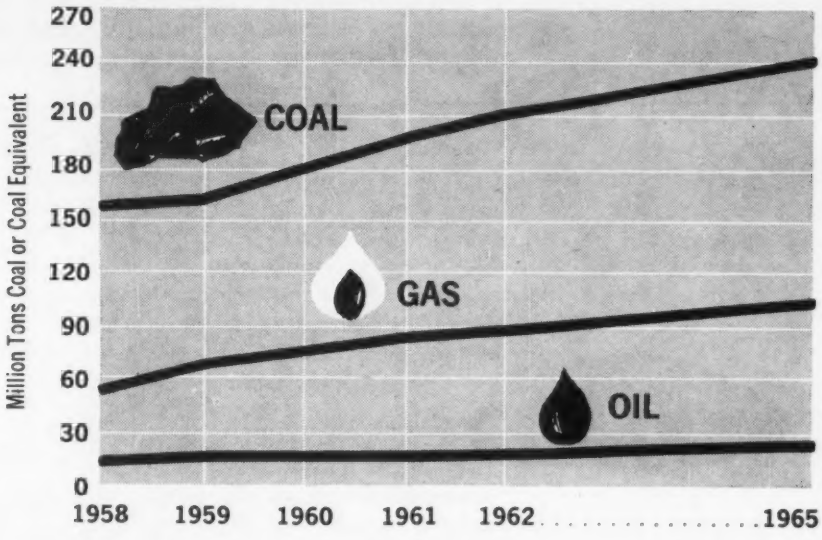


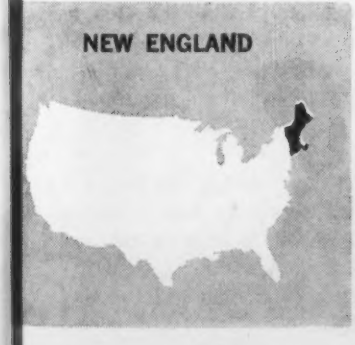
Report on
Fuel Outlook

Utilities Reveal Their Fuel Plans

Coal's position as the top utility boiler fuel of the future has drawn confirmation from the most reliable source—the utilities themselves. Joseph R. Forsythe, general manager of McGraw-Hill's "Keystone Coal Buyers Manual" sent questionnaires to the 443 U. S. utilities that use fuel to generate electricity, asking for their fuel plans through 1965. Responses from 248 of them, returned in November and December 1958 and January 1959, generally corroborate EW's "Report on the Fuel Outlook" published last spring. They also show that:

• **Utilities have cut their estimates of total fuel use in 1965.** A similar query sent out at the end of 1957 indicated that utilities would burn a total quantity of fossil fuels equivalent to 373 million tons of coal in 1965. This year's survey indicates a total burn for 1965 equivalent to 365 million tons. Probable cause: The recession, and attendant reductions in total generation estimates.

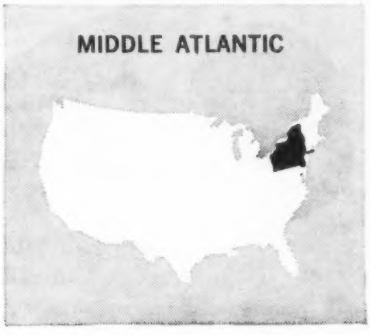
• **Oil and gas are not slated to lose their share of the market as rapidly** as had been anticipated a year ago. Lower prices have brought oil some substantial gains along the seaboards, and the recession has postponed the day when most utilities feel that gas will become strictly a premium fuel for residential and commercial uses. But coal is still expected to supply 65% of the fossil fuel market in 1965. Here's the regional outlook (units of all tables are thousands of tons of coal or coal equivalent):



Company		1958	1959	1960	1961	1962	1965
New England Gas & Electric	Coal	150	80	80	80	80	80
	Oil	80	290	350	410	460	720
	Gas	300	250	200	150	100	....
Connecticut Light & Power..	Coal	1,258	1,228	1,388	1,557	1,438	2,100
	Oil	29	30	32	32	32	32
	Gas	10	17	17	17	17	17

Most striking change of plans since last year is a switch from coal to oil by some coastal utilities. Last year, New England Gas & Electric visualized a gradual decline in gas use with coal due to take up most of the slack. Last year's plans for

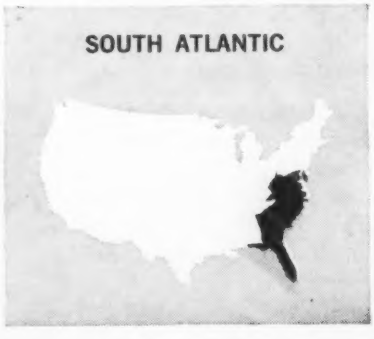
1965 included 500,000 tons of coal to supply about 60% of fossil fuel needs. Present plans call for more than 80% oil. Public Service of New Hampshire has also revised upward its plans for oil, but sees coal on top by 1965. Connecticut Light & Power looks to coal for about 98% of its 1965 fuel supply, although oil and gas estimates have increased. And farther inland at Western Massachusetts Electric, coal is due to supply virtually all fossil fuel requirements.



Company		1958	1959	1960	1961	1962	1965
Public Service Electric & Gas	Coal	1,689	1,775	1,911	2,219	2,762	4,000
	Oil	2,033	2,031	2,243	2,078	1,723	1,600
	Gas	727	948	956	956	956	956
Long Island Lighting	Coal	850	1,003	1,065	1,140	1,225	1,500
	Oil	322	92	35	21	36	....
	Gas	445	642	600	639	607	....
Philadelphia Electric	Coal	3,530	3,800	4,080	4,320	4,590	5,300
	Oil	600	830	660	740	810	800
	Gas	470	210	170	120	40	0

Competition from oil and gas has stiffened along the seaboard, but coal is considered the fuel of the future. Public Service Electric & Gas has trimmed 2 million tons of coal from its near-term estimates, replacing it with oil and gas, but expects coal to recapture the lion's share of its market by 1962. Long Island Lighting has doubled gas estimates since a year ago, but still looks to coal for its expansion. Philadelphia Electric has stretched out the period it expects to use gas as a boiler fuel, but looks for its disappearance by 1965.

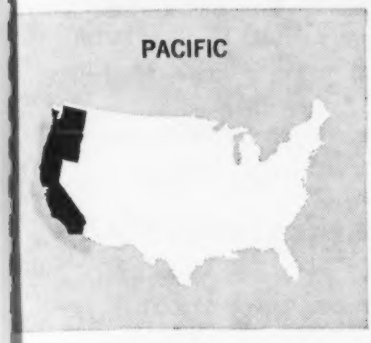
Farther inland, coal has almost no competition from gas or oil. New York State Electric & Gas, Niagara-Mohawk, Pennsylvania Electric, Duquesne Light, and most other inland utilities foresee no change in their 100% coal burn. The only downward revision was reported by Rochester Gas & Electric, where purchased Niagara hydro power will displace one million tons of coal in 1962.



Company		1958	1959	1960	1961	1962	1965
Florida Power & Light	Oil	2,500	2,500	1,800	2,300	2,800	4,800
	Gas	0	600	1,700	1,700	1,700	1,700
Tampa Electric	Coal	275	550	550	850	850	1,500
	Oil	503	323	323	323	323	323
Duke Power	Coal	3,800	4,200	4,500	4,700	4,900	5,810
	Gas	275	275	264	0	0	0

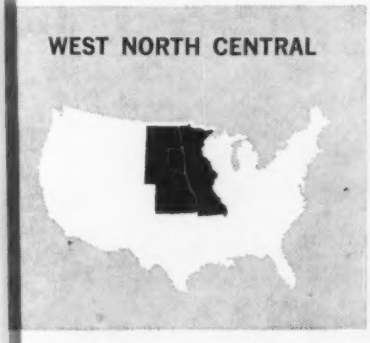
Several cross currents in fuel use are flowing in the South Atlantic Region. Florida Power Corp and Florida Power & Light Co are shifting from oil to gas. Gulf Power and Tampa Electric are moving from oil to coal. Duke Power is swinging from some gas to all coal. With new supplies of low-cost gas available, Florida Power is expecting a threefold increase in gas use this year; and Florida P&L, which burned no gas last year, will use it for half of its fuel requirements by 1960. No further increases are expected from 1961 to 1965.

Gulf and Tampa report no plans for gas, but both have already begun cutting their use of oil—replacing it with coal from Alabama, Kentucky, and Tennessee. Farther north, coal is already entrenched. Duke Power counts on no more boiler gas after 1960, will replace it with coal. Maryland, Delaware, and West Virginia utilities, including those on the coast, report that they will use more coal by 1965 or else that they already burn it 100%.



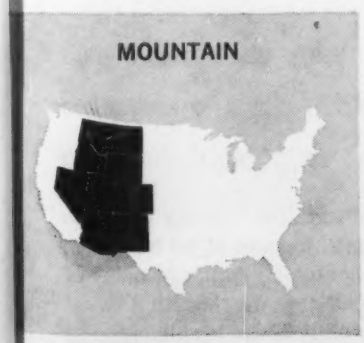
Company		1958	1959	1960	1961	1962	1965
Southern California Edison..	Oil & Gas	3,721	4,870	5,318	5,670	6,070	7,200
Los Angeles Dept of W & P	Oil	397	246	174	130	444	1,136
	Gas	1,531	1,997	2,241	2,471	2,340	2,682
Pacific Power & Light.....	Coal	20	417	489	558	630	850
	Oil	4	4	4	7	7	10
	Gas	8	10	10	10	10	10

In 1965 the principal fuels on the Pacific Coast will still be oil and gas, as they are today, but the proportions are harder to nail down. Los Angeles Department of Water & Power has shifted its plans more heavily to gas in the past year. Present plans for 1965 call for about a "70-30" split between the two fuels, with gas accounting for the "70". A year ago the Department split the market "55-45". The City of Burbank, however, has revised 1965 plans even more drastically in the opposite direction—from 85% gas to 80% oil. Southern California Edison reported a single total figure for oil and gas, noting: "Proportions uncertain due to nature of gas service, expected to vary between 40% and 70% gas." Coal has a foothold on the West Coast, with Pacific Power & Light reporting 850,000 tons expected by 1965. But oil and gas can expect no serious challenge from coal in the Pacific Region by 1965.



Company		1958	1959	1960	1961	1962	1965
Northern States Power.....	Coal	1,020	1,130	1,240	1,350	1,460	1,800
	Oil	280	280	280	310	340	360
	Gas	1,540	1,600	1,660	1,710	1,770	1,900
Kansas Power & Light.....	Coal	107	179	225	265	300	500
	Oil	6	18	15	15	20	50
	Gas	900	920	980	1,020	1,080	1,100
Omaha Public Power District	Coal	177	177	177	186	207	....
	Gas	326	395	444	450	470	....

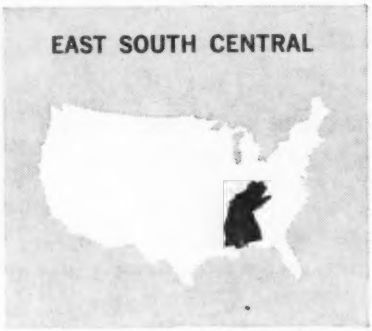
Coal and gas compete vigorously in the West North Central Region. Most revisions of fuel plans since last year favor gas, and oil has made some gains, but the long-term trend still favors coal. Last year Northern States Power expected that by 1965 coal would have taken the lead over gas, and oil was not mentioned. Now oil is scheduled to furnish a significant fraction of 1965 fuel requirements, and gas is expected to maintain a slim lead over coal. The Nebraska public systems and Iowa Public Service Co expect gas to supply a large and increasing proportion of energy, but in most other utilities of the region, coal is growing steadily in importance.



Company		1958	1959	1960	1961	1962	1965
Public Service of Colorado..	Coal	411	425	453	612	740	1,500
	Oil	14	14	14	20	20	25
	Gas	1,274	1,400	1,500	1,500	1,500	1,200
Arizona Public Service.....	Gas	599	655	973	1,109	1,539	2,034

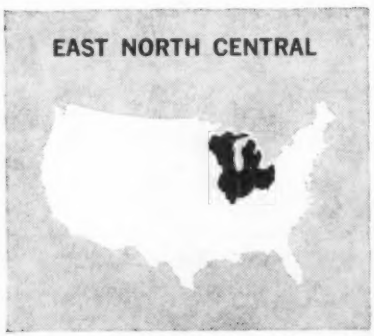
Utilities in the Mountain Region fall into two categories: Some, like Public Service Co of Colorado, and Southern Colorado Power, are expecting to displace gas with coal as the number one fuel. Others, like Arizona Public Service, Public Service of New Mexico, and Southern Nevada Power, are sticking with gas. The two Colorado utilities have become more coal conscious since a year ago: Public Service last year saw gas use climbing through 1965, but now expects it to hit

its peak by 1960 and decline by 1965; Southern Colorado Power has boosted its estimate of coal's share from just over half to about two thirds. Montana-Dakota Utilities has also upped its plans for coal. But gas is still unchallenged in the southern part of the region.



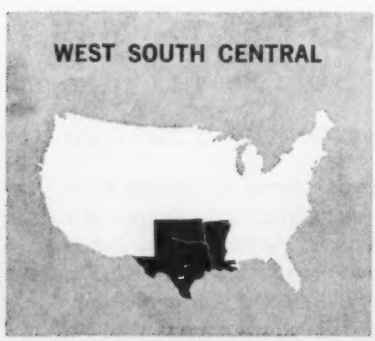
Company		1958	1959	1960	1961	1962	1965
Alabama Power	Coal	2,636	3,127	3,482	3,325	3,550	4,200
	Gas	586	583	284	274	.....	....
Tennessee Valley Authority	Coal	17,160	19,500	21,000	24,000	25,000	....
Louisville Gas & Electric	Coal	1,000	1,100	1,200	1,350	1,450	1,750
	Gas	250	225	200	200	200	200

Declining use of gas is the story from the East South Central Region, except for Mississippi, where it is expected to continue as the mainstay. Alabama Power sees its gas burn dwindling yearly, with all expansion coming in coal. Tennessee Valley Authority, the biggest fuel user in the region, will continue to burn nothing but coal under its boilers. In Kentucky, where coal already dominates the fuel market, the only reporting utility to mention another fuel was Louisville Gas & Electric; and its gas use is now slated to taper off sooner than the company had expected a year ago. Mississippi Power & Light is sticking with gas. Oil represents only a drop in the bucket for this utility, and coal does not figure in its reported plans at all.



Company		1958	1959	1960	1961	1962	1965
Toledo Edison	Coal	1,052	1,021	1,180	1,277	1,378	1,592
	Oil	10	5	3	3	4	4
	Gas	71	116	126	126	126	126
Detroit Edison	Coal	5,015	6,108	6,255	6,902	6,754	8,900
	Gas	120	200	250	275	250	250
Public Service of Indiana	Coal	2,444	2,619	2,754	2,912	3,128	3,625

The East North Central Region is already 95% coal territory, and no appreciable changes are in sight by 1965. Among the relatively few utilities that burn more than one fuel under their boilers, gas is the second choice. Plans of the multi-fuel utilities in the region call for increasing use of gas for the next two or three years, followed by a leveling off or a decline. Detroit Edison provides a good example of the modest inroads of gas: By 1965, the gas burn will have more than doubled over 1958, while the use of coal will have increased by only about 75%. The tonnage of coal is so overwhelming, however, that gas will then be supplying less than 3% of Detroit Edison's fossil fuel needs.



Company		1958	1959	1960	1961	1962	1965
Gulf States Utilities	Gas	1,800	2,000	2,240	2,520	2,800	3,880
Texas Electric Service	Gas	1,665	1,790	1,938	2,080	2,256	2,863

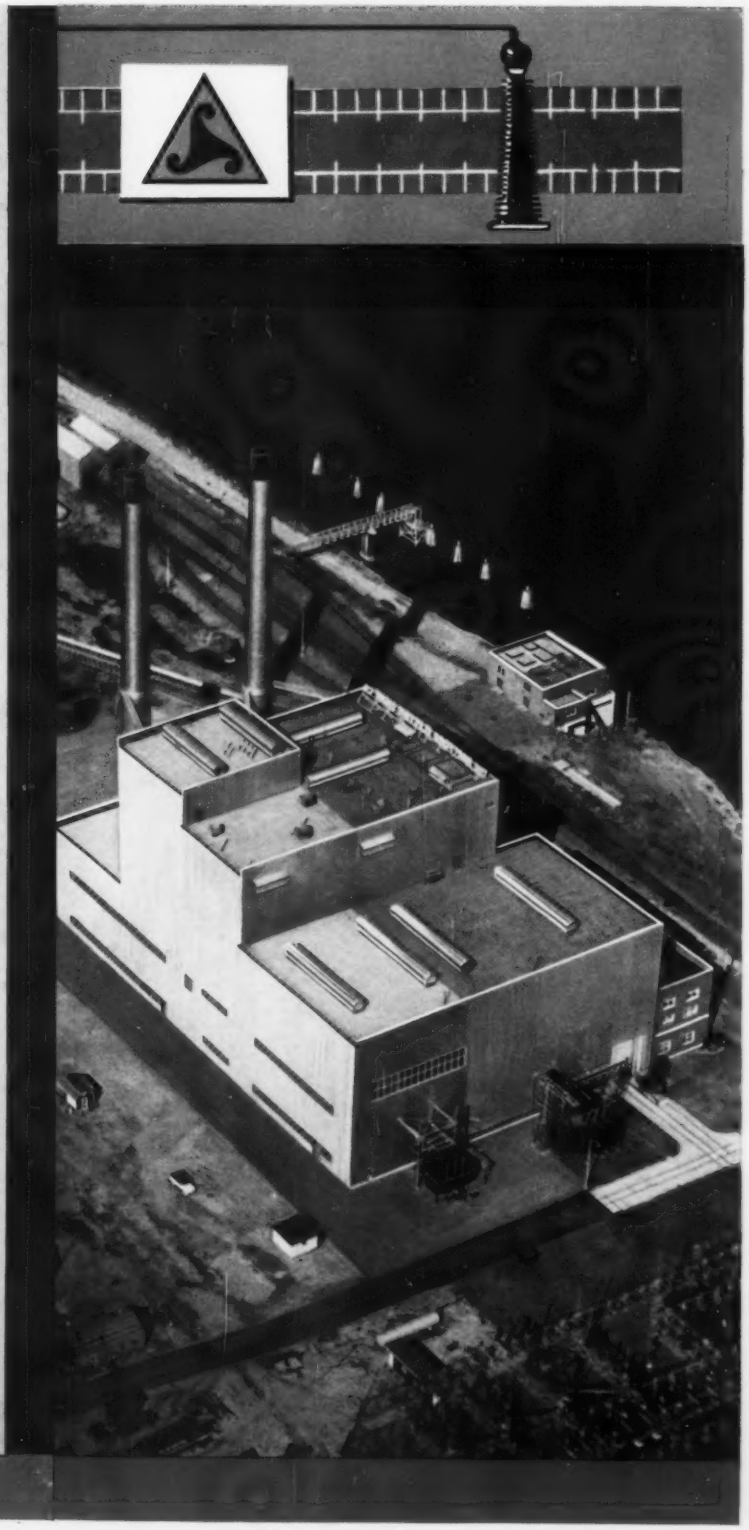
Gas dominates the West South Central Region, and Keystone's survey found no evidence to indicate any changes by 1965. The small amount of oil burned in Arkansas is insufficient to make a dent in the regional total. Although many of today's generating plants are designed to burn coal, the West South Central Region stands alone in the U. S. as an area where coal's presence is unlikely to be felt any time in the next six years.

More Power for Connecticut

Keeping pace with the growing power demands of Connecticut, the second unit in the Middletown Station of The Hartford Electric Light Co. at Middletown, Connecticut, was placed in operation in November, 1958. With almost twice the capacity of the first unit, the new 115,000 kw reheat unit with its accompanying auxiliaries was designed for the highest practicable efficiency.

Probable future station expansion was a key factor in the selection of the original project site on the Connecticut River. Room is available for three more units of larger capacity which, when completed, can increase the total plant capacity to 875,000 kw.

Stone & Webster Engineering Corporation designed and constructed both units at Middletown Station and is proud to have served The Hartford Electric Light Company on this and other important projects over many years.



STONE & WEBSTER ENGINEERING CORPORATION
A SUBSIDIARY OF STONE & WEBSTER, INC.

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1200 Temperatures entrusted to two L&N data systems!

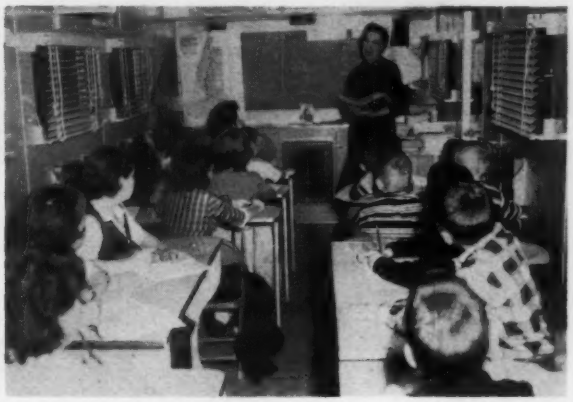
At the new Bergen Generating Station of Public Service Electric and Gas Company, two 600 point L&N Data Systems will monitor bearing, boiler tube, and condensate temperatures for No. 1 and 2 Units.

Electric typewriters will log data for each unit on continuous 8½" wide log sheets, perforated every 11" . . . one typewriter logging all 600 temperatures while the other is recording off-normals (in red) and up to 10 trends. All inputs are scanned every two minutes for off-normals, with scanning proceeding during logging and trending. As an example of the system's safety measures, all data can go through either typewriter so the operator is never left without vital information.

In designing this system, Public Service and L&N engineers made a thorough study of Bergen's requirements. L&N's contribution was based on 30 years' experience in power plant measurements and an expert knowledge of data processing. For data systems and other power plant controls, call your nearby Field Office or Leeds & Northrup Co., 4938 Stenton Ave., Philadelphia 44, Pa.

Data Systems engineered to power-plant standards by LEEDS Instruments LN NORTHRUP Automatic Controls • Furnaces

Five mobile schools like this . . .



are heated electrically as . . .

School Children Keep Warm While Learning

Electric heating is giving an assist to religious education by keeping Indianapolis, Ind., Mobile School Rooms used for that purpose warm and comfortable during instruction periods.

Five trailers have been purchased for use as school rooms. To maintain the "separation of church and state" the trailers are parked off the school grounds.

Each trailer is equipped with 9 kw of resistance electric heating. The Indianapolis Power & Light Co has provided connections and meters at 45 different locations. Trailers are parked near these service locations and a cable connection is plugged into a heavy-duty, weather-proof, convenience outlet. Thus, thermostatically controlled electric heating comfort is provided during the instruction period.

When a trailer has completed its stay at one location the electric service connection is pulled and the trailer is moved to a new location.

Instruction is provided one hour each week for fourth and fifth grade pupils, who are released from school upon written request of their parents.

Over 20,000 pupils and 30 full- and part-time teachers are engaged in this activity. Attendance is 87.7%.

Texas Shopping Center Has Air-Conditioned Streets

Now that offices, homes, schools, and cars are being air conditioned there is about only one major area left—the streets. Down in Texas they've solved that.

A regional shopping center in Dallas, Tex., has just been opened which has air-conditioned streets. Forty-one stores are connected by a landscaped, T-shaped mall 50 ft wide. The top of the T measures 415 ft, while the center is 540 ft long. This adds up to almost 46,000 sq ft of air-conditioned streets. Photo right shows an enclosed street area which enables it to be cooled electrically.

More than 1,800 tons of air conditioning cool the center. Every type of packaged unit is represented and each tenant space is air conditioned and controlled individually. With the exception of one steam absorption system in a department store, all units are electrical. The mall is cooled by Carrier 10- and 15-ton units, and a 78-deg temperature is maintained. Total air conditioning load is 2,000 kw.

Artificial light is used exclusively with a 33 ft-c intensity. The center is reported to have 200 mi of electrical wiring, 10,000 electrical outlets, and 14,000 electric lamps, mostly fluorescent.

The outside of the center is illuminated with mercury arc lamps, and there are more than 60 light standards.

The center is on Texas Power & Light Co lines since it is outside Dallas city limits. It is served with four transformers and total connected load is in excess of 3,500 kw.

the F/A Motor saves you time and money!

Scheduled inspections and cleanings that result in longer life for your large motors are now easier, less expensive and—for the first time—accomplished with motor parts in *full view!*

The Westinghouse F/A Motor can be prepared for routine inspection, examined, and be back in operation in 10 minutes. For planned yearly inspections, complete disassembly and reassembly take only an hour.

Routine or Weekly Inspection. It takes just three minutes to prepare for this inspection. Merely removing the side panel completely exposes the leads, winding ends and rotor air ducts. A quick cleaning takes care of any contaminants. In four minutes the side panel is back on, and the F/A Motor is in operation.

Detailed Annual Inspection. Such a complete disassembly as is shown at the right, above, is rarely done, because in conventional motors it is virtually impossible. However, with the Westinghouse F/A Motor it *can* be done, and in just half an hour! No other housing design permits such

.. to yearly shutdown ....

see-ability and accessibility. Here you can *completely* check windings and bracing, examine the ends of the rotor, check the condition of the *total* core and check all bolts for security. Necessary cleaning can be done in minutes, and with a thoroughness heretofore impossible. Then, in roughly 30 minutes, reassembly of side panels, top air shields, end covers and top enclosure puts the F/A Motor back "on the line."

For full information on the long service life, reliability and accessibility of the Westinghouse F/A Motor, call your Westinghouse representative or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-15003

CHECK THESE BONUS VALUES IN THE F/A MOTOR

- Full Accessibility
- Inherently Quiet—housing and stator separated
- Thermalastic® Insulation—recognized as the finest
- Time-Proven Components—longer, more efficient life
- Easy Connection—conduit boxes eliminated

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Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Webster Named President of NEES

William Webster has been made president of the New England Electric System succeeding Irwin L. Moore who continues as chairman of the board, and becomes chief executive officer. Webster is on the left and Moore on the right in the photo.

Webster joined the System in 1928. In 1935, he was appointed executive vice president of Narragansett Electric Co, and in 1942 became a vice president of New England Electric. He was next made president of Narragansett Electric in 1948, and became executive vice president of NEES in 1950.

Webster is also president of Yankee Atomic Electric Co, a group of New England electric utilities now building an atomic electric generating plant at Rowe, Mass.

Moore, who had been president since 1941, has also been president of the International Hydro-Electric System. He joined the New England Power Co, predecessor of NEES, in 1920 as an engineering assistant. Before that, he was a chemist in the Bureau of Standards in Washington, an instructor in electrical engineering at M.I.T., an engineer for the Aluminum Co of America, and assistant to the president of International Paper Co.

Morrill Elected Head of Hubbard & Co

John R. Morrill has been elected president of Hubbard & Co. He replaces Charles H. Dyson who will remain on the Hubbard board of directors.

Morrill had been general manager of the Evansville Division of Bendix Westinghouse Automotive Air Brake Co.

Prior to joining Bendix Westinghouse, he was with the Lincoln Electric Co, Cleveland, O., where his positions included assistant to the vice president in charge of public relations, sales promotion, dealer relations, and advertising; and vice president in charge of sales.

He is an engineering graduate of Stanford University.

Jensen Heads New NEMA Committee

Donald H. Jensen, director of public relations for the Square D Co, has been named chairman of the National Electrical Manufacturers Assn's new Public Relations Committee. Its purpose is to work toward improving internal communications and relations with allied "customer" groups.

Other members of the committee are: K. W. Haagensen, director of public relations, Allis-Chalmers Manufacturing Co; Dale McFeatters, vice president, information services, Westinghouse Electric Corp; Ralston B. Reid, manager, advertising and sales promotion, General Electric Co; and R. H. Smith, secretary, Reliance Electric & Engineering Co.

Look to HAPCO...*for Modern Styling, Permanence and Economy*

Virginia's 35-mile Richmond-Petersburg Turnpike is another outstanding example of the many streets and highways from coast to coast that depend on HAPCO poles and brackets to help brighten the way for safer night driving.

HAPCO Aluminum Standards offer a new concept in modern styling, permanence and economy in lighting standard design that has made them especially desirable for use wherever outdoor lighting is needed.

For complete information on Lighting Standards and Brackets ask for the new HAPCO Catalog HAL 259. Write to Hubbard Aluminum Products Co., 6301 Butler St., Pittsburgh 1, Pa.

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by specialists

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of Quality furnished
to property owner

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A product of Page Steel & Wire Division
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PERSONAL BRIEFS

Duke Power Co has made six executive changes: **E. E. Williams,** vice president in charge of steam production, has been relieved of his steam department responsibilities to devote full time to other management assignments; **R. W. Olive** has been appointed manager of steam production; **E. D. Powell** has been named assistant to Olive; **G. G. Mattison** has been made manager of production and transmission; and **A. C. Thies,** steam production engineer, and **Frank W. Edwards,** distribution planning engineer, have been appointed assistants to Mattison.

William H. Barnwell has been named supervisor of promotion for the Charleston Division of South Carolina Electric & Gas Co.

John E. Gray has been appointed coordinator of atomic power for Duquesne Light Co.

Walker L. Cisler, president of The Detroit Edison Co, has been appointed national chairman of Invest-In America Week for 1959, which will be observed April 26 through May 2.

Leslie A. Hicks, president of the Hawaiian Electric Co, will retire on June 30, his 40th anniversary with the company.

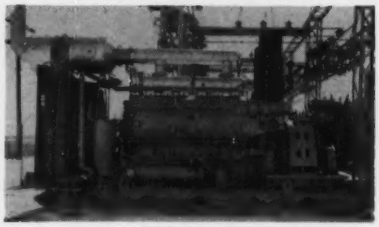
M. O. Whithed has been appointed rural service manager of the Edison Electric Institute. He was formerly rural service supervisor for Atlantic City Electric Co.

Edward J. Ingram, a director and vice president of sales for Jersey Central Power & Light Co and New Jersey Power & Light Co, has retired to accept a position in the midwest.

Donald E. Nelson has been elected general counsel for Northern States Power Co.

Willard Davis has been named new process and new products investigation supervisor, Research & Development Dept, Keasbey & Mattison Co.

Peak power demand met with portable generators



Two portable diesel engine generator plants, rushed from the West Coast and installed all within 2 weeks, met an unprecedented peak-season demand for increased power on Florida Keys Electric Cooperative Association. The generators of 750kw and 300kw operating on a temporary basis at the association's Marathon plant were leased, shipped and installed by the A. G. Schoonmaker Company from Sausalito, California.

Diesel generators from 100kw to 1000kw are available from A. G. Schoonmaker Company on short term lease, long term lease or on a lease-option arrangement for installation anywhere in the world.

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MINERALLAC

Phillip L. Alger, an internationally known electrical engineer, whose work helped to motorize American industry, retired from the General Electric Co recently. He is now an adjunct professor at Rensselaer Polytechnic Institute.

International Business Machines Corp has promoted **Charles J. Lawson** to assistant director of manufacturing services on the corporate staff.

Fred W. Burtner has been named supervisor of training and development for Line Material Industries, McGraw Edison Co.

D. E. O'Conner and **T. J. Merritt** have joined the Houston, Tex., engineering department of Commonwealth Services Inc.

Irving Lipkowitz has been named director of economic affairs for Reynolds Metals Co.

Theodore L. Kishbaugh has been appointed general manager of the Wallingford, Conn., plant of Joseph T. Ryerson & Son, Inc.

Dr. Mervin J. Kelly, chairman of the board of directors of Bell Telephone Laboratories retired March 1.

T. P. Bronco has been appointed assistant to the general manager-sales activities of Page Steel & Wire Division, American Chain & Cable Co.

Hubbard & Co has promoted **Richard D. Okerberg** to chief engineer of electrical apparatus.

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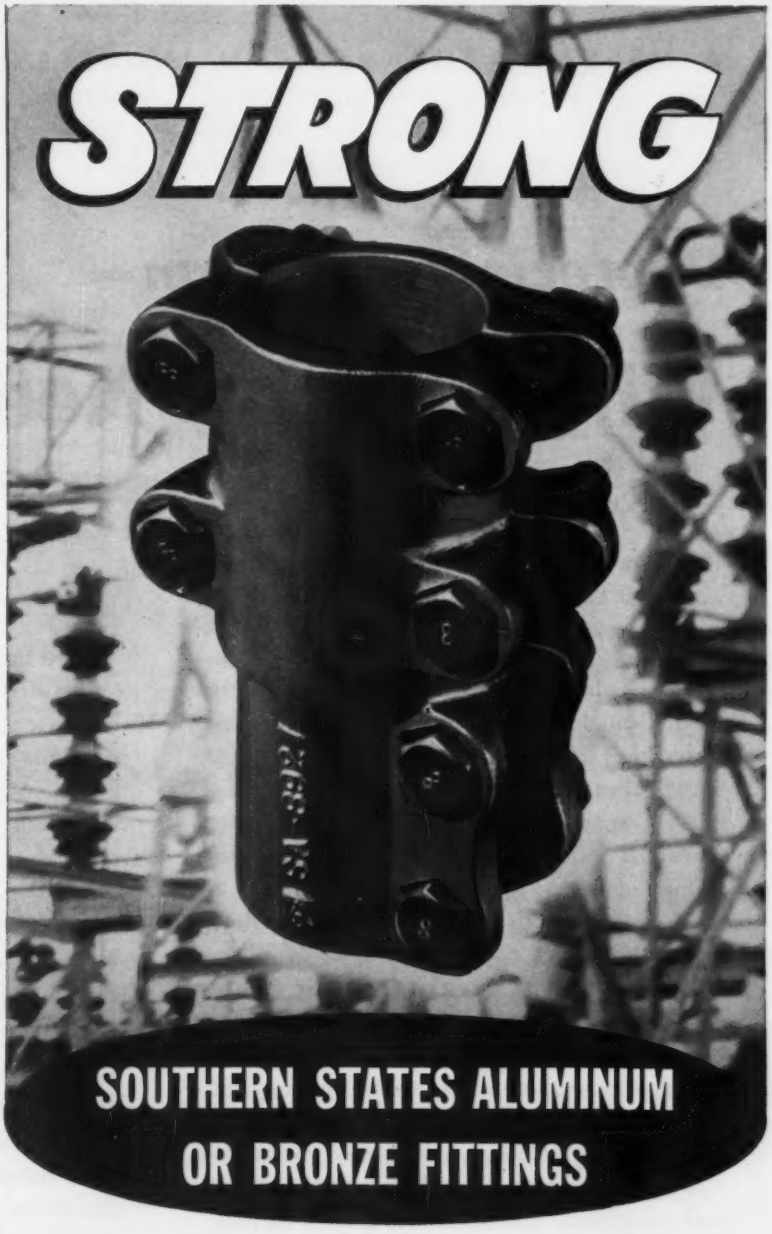

Frequent use of connectors as supporting members requires that they be physically strong as well as electrically sound. To achieve this, and yet avoid excessive bulkiness and weight, Southern States uses proven alloys—developed over a period of more than 25 years. All of the fittings in the ever-expanding line of Southern States connectors are designed to assure you of maximum strength. *Never underestimate the importance of a good connection!*

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Depreciation Reform—

Why Industry Needs A Modern Tax Policy

A shockingly large proportion of our industrial plant and equipment is obsolete. As indicated by an earlier editorial in this series, over $95 billion would have to be spent —and spent soon—to bring our industrial facilities up to the best modern standards. Yet plans for 1959 call for little more than $30 billion of actual spending—barely enough to make a start on this backlog of modernization.

At the heart of the problem of obsolescence is a federal tax policy that discourages business from replacing inefficient facilities. It is the purpose of this editorial to spell out a tax reform Congress can make this year—with little cost in terms of tax revenue—that would go a long way toward removing the barrier to modernization of plant and equipment. This reform is a more realistic system of tax deductions for depreciation and obsolescence of productive facilities.

A Barrier to Modernization

Industry abounds with examples of old and obsolete facilities—despite large expenditures made in the past few years. Two-thirds of our metalworking equipment is over ten years old. Over half the capacity of our chemical process industries was installed before December 1950. Only a minor fraction of our railroad freight moves in new freight cars or the new push-button freight yards.

The tax law bears a large part of the responsibility for this lag in modernization because of its important influence on business investment in plant and equipment. For many years the tax law has permitted as a deduction from income "a reasonable allowance" for wear and tear and obsolescence of productive facilities. These annual deductions affect business investment in several ways.

- They are the way a company recovers its investment in plant and equipment.
- They determine in large measure, the amounts of money that are spent each year to replace and modernize facilities.
- Furthermore, the schedule for depreciation often determines **when** a specific machine or building is actually replaced.

The law requires that depreciation deductions be spread over the "useful life" of a building or machine. But the periods of useful life for tax purposes today still depend heavily upon tables drawn up by the Treasury almost 20 years ago. These tables reflect the replacement practices of depression years. Also, they were compiled at a time when the pace of technological progress in industry was much slower than it is now. **For nearly all types of equipment the indicated period of useful life is longer —sometimes much longer—than most experts consider realistic at today's rate of technological advance.**

The result of these outmoded depreciation schedules is that the recovery of investment is dragged out, and the replacement of obsolete equipment is delayed.

In The Right Direction

Congress should establish, by law, the right to use shorter depreciation periods on productive equipment. It should do so in a way that would free industry from obsolete concepts of the rate of technological change and would provide incentives to install new equipment and produce new products.

The tax reform act of 1954 made some progress in this direction—but not enough. It introduced new methods for calculating depreciation —the declining balance and the sum-of-the-years' digits—which enable a business to recover most of the investment in a new facility in the early years of its useful life. However, these new methods do not accomplish their desired purpose when the supposed "useful life" is still an unrealistically long period of years.

Industry is by no means free from blame for the failure to bring depreciation policy into line with the needs of a modern, growing economy. According to Joel Barlow, president of the Tax Institute, "management has largely ignored the Commissioner's invitation . . . to come into the Internal Revenue Service office and make a case for shorter depreciable lives by establishing technological obsolescence."

The failure of many companies to see their own interest in more realistic depreciation not only holds them back from modernizing their own facilities but also lends support to the Treasury in its continued adherence to an outdated policy.

A Suggestion For Reform

An excellent model for reform of the depreciation policy in our tax law is the system used successfully in Canada for a decade. In Canada, all productive equipment may be depreciated at relatively fast rates assigned to each of 14 broad categories. The Canadian system permits depreciation up to twice as fast as the antiquated tables of useful lives now followed in the U. S. It also gives the individual business far greater flexibility in determining depreciation schedules that fit its own needs and experience.

For example, in the category or "bracket" covering general machinery a taxpayer in Canada may depreciate up to 20% of the machine's value annually, on a declining balance basis. In the U. S. the fastest rate at which many types of machinery can be depreciated is only 10%. In other categories, from tools and dies to buildings and pipelines, the Canadian system also allows faster depreciation and provides greater incentive to invest in new facilities.

The cost of this reform in terms of lower tax revenue would be small—probably less than $500 million in the first year. And even this would merely be postponed, not permanently lost. Indeed, there is a very good prospect that tax revenue would not suffer at all. The increase in spending for new plant and equipment resulting from this tax reform would mean an increase in wages and profits—and therefore in taxes—in industries that produce machinery and other capital goods.

A realistic tax policy on depreciation would provide a badly needed incentive for industry to replace obsolete and inefficient facilities with up-to-date plants and equipment. It would step up our rate of technical advance and economic progress. And it would put U. S. industry in better shape to meet the growing competition from other countries that have grasped the advantages of fully modern technology.

This message was prepared by the McGraw-Hill Department of Economics as part of our company-wide effort to report on opportunities for modernization in industry. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or part of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

Allen Plant Builds for 5 Units with 1,200-Mw Capacity (*Continued from page 58*)

each generator's leads. Stand-by and start-up supply is from an 18,000/24,000-kva, OA/FA transformer connected to the 100-kv bus. The 4,160-v sides of both transformers are wye-connected and solidly grounded. Only one starting transformer will be installed for the five-unit plant. The capacity of the starting transformer is such that it can operate as a stand-by for either Units 1 or 2 and still be able to start Units 3 and 4. Acting as a stand-by for Units 1 and 2, it can also supply half the auxiliary power requirements for Unit 3 or 4.

Station auxiliary motors 200 hp and over are 4 kv, and motors below 200 hp are 550 v. Filters on air inlets of motors on boiler feed pumps, I.D. and F.D. fans, and pulverizer mills reduce maintenance. Formerly, it was necessary, after the short period of operation during completion of construction, to disassemble these large motors and clean away accumulated construction dirt. Abandonment of the practice will more than pay for the filters. An undervoltage relay on nonessential motors trips the motor and reduces load on throwover to the emergency source.

Control of Units 1, 2, and 3 will be from the control room adjacent to Unit 1 in the service building area from whence the turbine and boiler rooms can be seen. Besides the boiler and generator controls in this room are the electrical control and relay boards for both the 100 and 230-kv substations. The top slab of both boiler and generator benchboards are $\frac{3}{16}$-in. pickled stainless steel which needs no repainting.

In the design of the cable layout, power and control cable are separated, the former being installed in steel conduit mostly exposed. Control cable is in metal trays, the ladder type tray being preferred for its adaptability. All cable trays have covers. In the duct bank from the power plant to the substations, 2-in. plastic conduit in 30-ft lengths is encased in concrete. The plastic conduit costs less than transite or steel and can be installed in about a third of the time.

All power cable is purchased "over insulated" for its application, *ie*, for 4-kv service cable insulation is 7 kv and for 575-v and 250-vdc service 2 kv.

Units 1 and 2 have each a continuous capability of 175 Mw, and the costs based on this capacity during construction were:

Units 1 and 2	Cost
Plant cost (less step-up substation)	$106.30/kw
Step-up Substation (including transformers and line positions)	5.70/kw
Total Cost	$112.00/kw

This total cost includes the cost of facilities built for the ultimate plant. Where the cost of these facilities is charged to Units 1 and 2, the total cost would be $12 per kw as compared with a future allocated charge of $3.50 per kw. Deduction of $8.50 per kw from the total cost would give a net cost per kw of continuous capability of $103.50. Eliminating the step-up substation, the net cost per kw of capability would be $97.80 per kw.

It is interesting to compare on the basis of equal performance the cost of Allen Units 1 and 2, installed in 1957, with that of four other units installed in 1950-51, the latter having the same combined capability as the Allen units. The cost per kw for Allen is $97.30; that for the older units, $97.90. Thus the gain in efficiency helps to hold down power production cost.

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BOX NUMBER

When answering the classified advertisements in this magazine don't forget to put the box number on your envelope. It's our only means of identifying the advertisements you are answering.

ENGINEERS AND MATERIALS INSPECTORS WANTED

The Tennessee Valley Authority wants electrical design engineers to develop electrical layouts, prepare and/or check designs, computations, and detailed drawings for various electrical systems for hydro electric and steam-electric projects. A college degree in electrical engineering, or its equivalent, with from one to three years of design experience including familiarity with specifications for procurement of electrical equipment, is required. Annual salaries range from $5900 to $6800 for 40-hour workweek. Location is Knoxville, Tennessee. Also, electrical inspectors are needed to make inspections of electrical materials and equipment, such as generators, switchboard, transformers, etc., at manufacturing plants. Positions require a college degree in electrical engineering, or its equivalent, plus experience in engineering inspection and testing of electrical equipment and materials. Annual salaries range from $5550 to $6325 for a 40-hour workweek. Location is Milwaukee, Pittsburgh, or Schenectady.

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Division of Personnel, Knoxville, Tennessee

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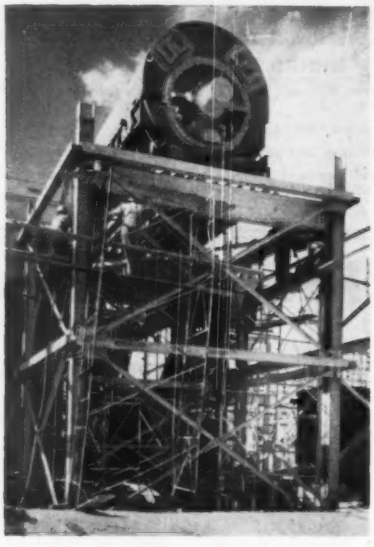

Lifting Rig Story

To the Editor:

Referring to Electrical World, Jan. 5, (p 34) I reviewed with interest the article "Devise Rig to Lift 165-Ton Stator." It appears that this device is a satisfactory tool serving the power industry in the erection of generator stations, rotors, and/or steam turbines during construction of large central stations, especially when the plant crane is not available.

I would like to call attention to the similarity of the device to one that the Stearns-Roger Manufacturing Co designed in the fall of 1951 and used for the same purpose in Feb. 1952. I am enclosing photograph (see above) illustrating the generator stator erected for Public Service Co of New Mexico. This lifting tower has been used seven times since.

Air jacks were used in all our projects. The time for completing the lift is directly proportional to the jacking method used, and the economics reflecting use of the device are therefore also proportional. We are now designing a greatly improved tool for the same purpose.

R. A. Withrow,
The Stearns-Rogers Manufacturing Co,
Denver, Colo.

Who Makes Remote Alarm?

To the Editor:

The Electricity Supply Commission of Southern Rhodesia has expressed interest in the article, "Device Phones in Remote Alarm Orally," (EW, Jan. 5, p 36).

We should be much obliged if you could put us in touch with the makers of the electronic Sentry.

W. L. Kerr, Ltd.
P. O. Box 834
Salisbury,
Southern Rhodesia

The device is manufactured by Electronic Secretary Industries, Inc, 1101 South Prairie Ave, Waukesha, Wisconsin, a subsidiary of General Telephone Co. For use in either General Telephone Co or Bell Co areas, contact the local phone company office. For use in other areas, write direct to the manufacturer.

"Electric" vs "Electrical" Put Rather Nicely

To the Editor:

Re: Electrical vs Electric

Our General Electric style manual defines the matter rather nicely for us. We use **electric** when describing anything in which an electric current is present; we use **electrical** when describing anything associated with electricity. This gives us electric motors, but electrical engineers.

Works like a charm.

A. F. Kee
Government Instruction Books
Technical Publications Section
Advertising & Sales Promotion Dept.
General Electric Co
Schenectady 5, N. Y.

To the Editor:

Under the rather strict definitions that Mr. Garcia sets down for "Electric" and "Electrical" (EW, Feb. 9, p 90) . . . should not Mr. Garcia's company be "General Electrical?"

D. C. Austin
Coordinator Publicity & Public Relations
I-T-E Circuit Breaker Co
1900 Hamilton St.
Philadelphia 30, Pa.

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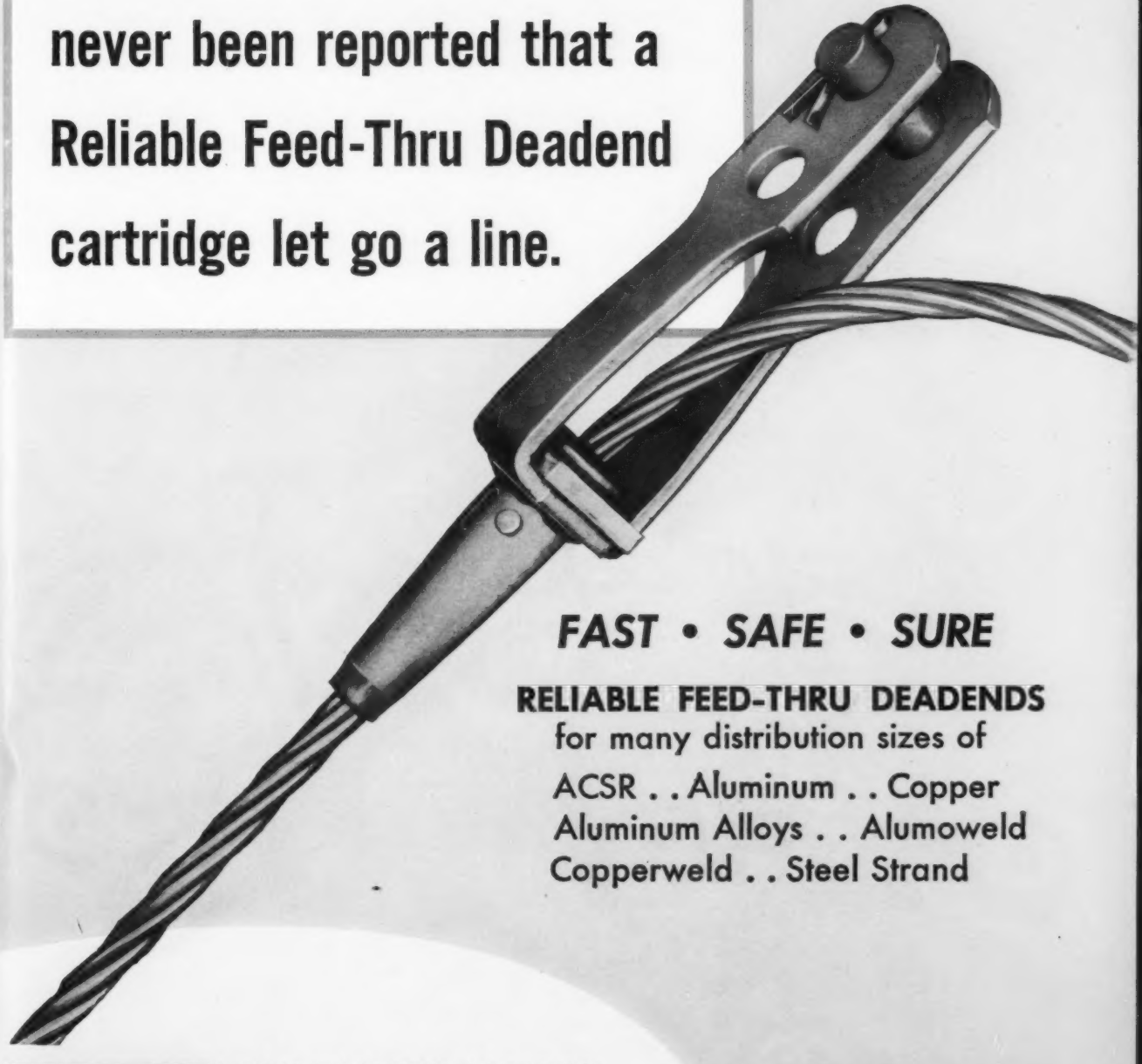

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